SURGERY OF THE ŒSOPHAGUS

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PREFACE

The aim of this book is to present the œsophagus as a whole and to avoid those artificial divisions of the gullet which have become accepted in the past That these topographical divisions should have arisen was inevitable because during its course the œsophagus traverses the territory held respectively by the ear nose and throat surgeon the thoracic surgeon and the abdominal surgeon All these specialists have played an honourable part in elucidating the problems within their own territorial limits and the chest surgeons in particular by making thoracotomy a safe procedure have contributed to the subject in full measure There have been disadvantages in this mode of specialisation for example reflux œsophagitis has failed to attract attention until recently because œsophagoscopy was seldom undertaken except by the ear nose and throat surgeons many of whom have been endoscopists of the highest order but their chief interest and loyalty have always been to the upper œsophagus and pharynx and in these parts of the gullet their contribution has been pre eminent In the thoracic œsophagus however their interest has often been limited to foreign bodies carcinoma cardiospasm and well-developed strictures Their treatment of these conditions has usually been limited to endoscopic methods It is no reflection on these surgeons if they failed to take notice of a condition which often masquerades as an ulcer of the duodenum

It would appear that very specialised surgery often requires the most general training The competent œsophageal surgeon should have a good knowledge of the gullet in all parts of its course he must be able to use the œsophagoscope with safety and he must keep himself up to date with the details of surgical technique which enable him with the help of the skilled anæsthetist to explore the chest without undue risk Moreover his experience of abdominal surgery must be such that he can appreciate the possibilities and limitations of utilising the stomach and bowel for the purpose of restoring the continuity of the gullet and he must be able to carry out an anastomosis in what may be difficult circumstances If he is to be successful in operating upon congenital atresia of the œsophagus he must have an adequate training in the surgery of small infants

In short there is much to be said for the surgery which is described and discussed in the following pages to be undertaken by the experienced general surgeon who is prepared to master the special points to which attention is drawn and it is to this class of surgeon that this book is chiefly directed The term general surgeon is introduced with some diffidence because in some quarters it has come to be applied as a form of criticism and indeed the surgeon who flits lightly from one part of the body to another without thought or care seldom alighting on the same spot twice is properly regarded with suspicion On the other hand it must be recognised that there are regions in the body as for example the cardiac end of the stomach which have suffered from being in a sort of no man s land of surgery and it is as absurd for the chest surgeon to limit his excision of the œsophagus in all cases to the level of the diaphragm as it would be for the abdominal surgeon always to stop short below the diaphragm even though the growth invading the stomach is extending higher that he had thought

These remarks are in no sense directed against specialization and still less are they intended to advocate even more *generalised surgery* but they are intended rather to point the way to a more rational approach to a difficult branch of surgery so that an organ can be treated as a functioning whole and attention is not directed to one part only as it passes through a certain area or compartment of the body Co operation with the plastic surgeon the radiotherapist the ear nose and throat surgeon and the thoracic surgeon is essential if progress is to *be maintained*

Some of the opinions put forward in the book may be controversial many of the conditions discussed are still ill understood but the surgery of the œsophagus has passed the pioneer stage and it seems proper to make an attempt to put on record those procedures which I have found to be of value in my own experience and many more which I was taught by the late Professor Grey Turner who was a true pioneer in that he *kept the interest in the œsophagus alive* at a time when it was largely regarded as a hopeless problem

It is a pleasure to express my gratitude to my colleagues in all departments at the Postgraduate Medical School of London and at Kingston Hospital for their kindness in referring patients to me and for their co-operation in radiological and pathological investigations To mention them all by name would prolong this preface unduly but in *particular I would like to thank Professor Ian Aird the Director of the* Department of Surgery at the Postgraduate Medical School of London

As the result of his organisation of the Department I have been able to continue and extend the œsophageal work of the late Professor Grey Turner and his encouragement and advice have been invaluable

I would like to thank Miss Helen Wilson for her illustrations Mr E Victor Willmott F I B P F R P S for the photographs and Miss E Scott for her care in preparing the typescript Mr T H Clare of Edward Arnold & Company has been ready with sound advice at every stage and at all times has shown unfailing courtesy and patience

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CHAPTER I

THE ANATOMY OF THE ŒSOPHAGUS AND THE PHYSIOLOGY OF SWALLOWING

The œsophagus begins in the neck opposite the sixth cervical vertebra at the lower border of the cricoid cartilage and is continuous with the pharynx In the adult it is about 25 cm (10 in) long It descends through the superior and posterior mediastinal cavities lying in front of the vertebral column and leaves the thorax at the level of the tenth thoracic vertebra It ends at the cardiac orifice of the stomach at the level of the eleventh thoracic vertebra The course of the œsophagus is slightly curved At its origin it is in the mid line but it passes slightly to the left as far as the root of the neck and then back to the mid line at the level of the fifth thoracic vertebra and again to the left to reach the œsophageal opening in the diaphragm (Fig 1) The œsophagus also shows antero-posterior curves which correspond with the curves of the neighbouring portions of the vertebral column It is constricted slightly at three points

(1) At its beginning
(2) where it is crossed by the left bronchus
(3) at the œsophageal hiatus in the diaphragm

Relations

The relations of the œsophagus in its course through the neck and thorax are shown in the accompanying transverse sections (Figs 2–8)

During its course the œsophagus comes into intimate contact with many of the important structures in the neck and with nearly all of those in the thorax This fact coupled with its inaccessibility makes the surgery of the œsophagus difficult and dangerous

Two regions present particular difficulty on account of anatomical considerations

The first is in the region of the arch of the aorta. Here the œsophagus lies behind and to the right of the arch, to which it is closely applied, as well as to the termination of the trachea and to the left

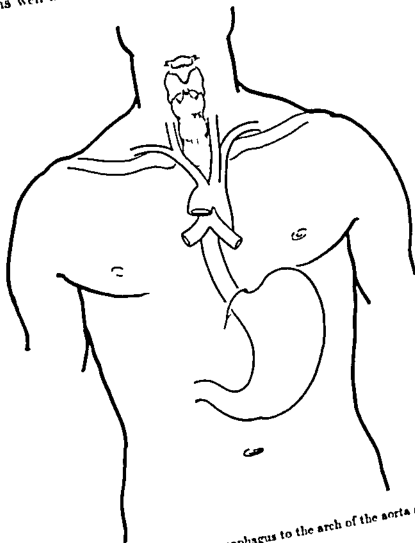


FIG 1.—Relationship of the œsophagus to the arch of the aorta and root of the lung

bronchus. Between these structures and the œsophagus lie the left recurrent laryngeal nerve and delicate branches passing to the cardiac plexus. This part of the œsophagus is in contact with the right pleura and right vagus nerve (Fig 4)

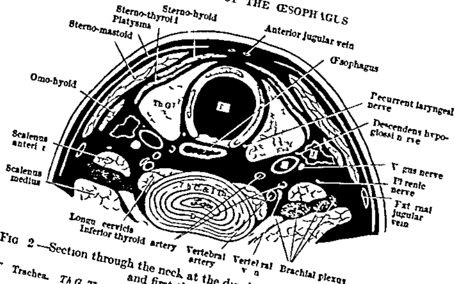


FIG 2 —Section through the neck at the disc between the seventh cervical and first thoracic vertebra

T Trachea. *Th G* Thyroid gland. *J* Internal jugular vein *C* Common carotid artery

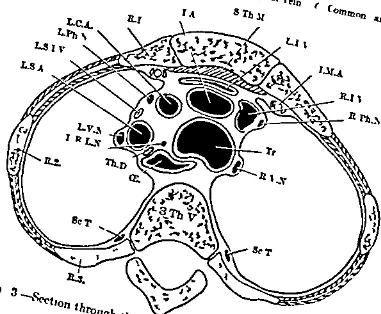


FIG 3 —Section through the first rib in front and the third thoracic vertebra behind

S Th M Sternothyroid origin. *L I V* Left innominate vein. *I M A* Internal mammary artery *R I V* Right innominate vein *R Ph N* Right phrenic nerve *L Ph N* Left phrenic nerve *I A* Innominate artery. *L C A* Left carotid artery *L S A* Left subclavian artery *L S I V* Left superior intercostal vein. *L V N* Left vagus nerve *R V N* Right vagus nerve *L R L N* Left recurrent laryngeal nerve *T* Trachea *Œ* Œsophagus *Th D* Thoracic duct. *Sc T* Sympathetic trunk.

The second region of note presents dangers rather than difficulties, and is at the thoracic inlet. Here the œsophagus together with other important structures has to crowd through a comparatively small and unyielding aperture (Fig. 2). In carrying out operations on this part of the œsophagus great care must be taken to avoid damaging the vagus, recurrent laryngeal and cervical cardiac nerves.

FIG. 4.—Section through the fourth thoracic vertebra behind and the upper part of the second costal cartilage in front.

I M A, Internal mammary artery. *S V C*, Superior vena cava. *R Ph N*, Right phrenic nerve. *L Ph N*, Left phrenic nerve. *Ao*, Aortic arch. *Tr*, Trachea. *L V N*, Left vagus nerve. *R V N*, Right vagus nerve. *L R L N*, Left recurrent laryngeal nerve. *Th D*, Thoracic duct. *Œ*, Œsophagus. *R S I V*, Right superior intercostal vein. *L S I V*, Left superior intercostal vein. *S T*, Sympathetic trunk.

In the lower part of the posterior mediastinum the thoracic duct lies behind and to the right of the œsophagus; it passes behind the œsophagus as it ascends, and crossing to the left at the level of the fourth thoracic vertebra, continues on its left side. The vagus nerves are in contact with the œsophagus below the roots of the lungs, the right nerve behind and the left in front, both nerves forming a plexus which surrounds the gullet.

Structure

The œsophagus lies in a bed of loose areolar tissue which allows free lateral movement and enables it to adapt itself to the passage of food It is composed of four coats

(1) External or fibrous
(2) Muscular
(3) Submucous or areolar
(4) Internal or mucous

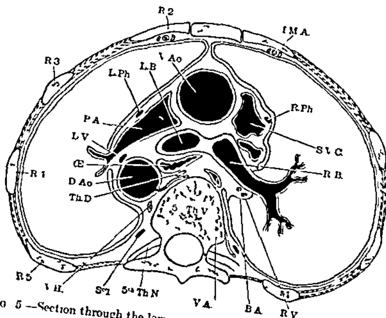


Fig 5 —Section through the lower part of the second costal cartilage in front and the fifth thoracic vertebra behind

I M A Intern l n mmary rtery L B Left bronch R P R ght bronchu V A Ascending orta D A Descending thora c aorta n rv S V C Supe r vena v L Ph Left phren n rve P A Pulmon ry tery (front of th right bron hu an th r bran h of th is seen) L V Left agu R V Right agus Œ Œs ph gus Th D Th raci duct V A Vena a ygos V H Ven hemia ygos B A Bron hial art ry S T Sympathet trunk

External or fibrous coat This consists of loose connective tissues containing longitudinal elastic fibres The larger blood and lymphatic vessels run among these fibres together with the vagi and the larger branches derived from these nerves

Muscular coat The muscular coat consists of an outer longitudinal and an inner circular layer The longitudinal fibres surround the

œsophagus over the greater part of its length but about 4 cm below the cricoid cartilage the fibres at the back of the tube diverge to form two bundles which pass upwards and forwards to the front where they pass under the lower border of the inferior constrictor of the pharynx and end in a tendon which is inserted into the ridge on the posterior surface of the lamina of the cricoid cartilage A V shaped interval is left between the diverging bundles, which is filled by the circular fibres

FIG 6—Transverse section through the thorax at the level of the third costal cartilage

I.M.A. Internal mammary artery *S.T.* [illegible] *P.A.* Pulmonary artery [illegible] *A.A.* Ascending aorta and valve *R.Ph.* Right phrenic nerve *L.Ph.* Left phrenic nerve *S.V.C.* Superior vena cava [illegible] the right atrium *L.A.* Left atrium *L.A.A.* Left auricular appendage *L.P.V.* Left pulmonary vein *R.P.A.* Right pulmonary artery *L.P.A.* Left pulmonary artery *Br.* Bronchus *B.N.* Bronchial lymph nodes *D.Ao.* Descending aorta *Œ.* Œsophagus *S.T.* Sympathetic trunk *Th.D.* Thoracic duct [illegible] *R.V.* Right vagus *L.V.* Left vagus *V.Az.* Vena azygos

which are reinforced below by a few decussating longitudinal fibres and above by the overlapping lower edge of the inferior constrictor The circular fibres are continuous above with the inferior constrictor posteriorly and anteriorly find insertion into the lateral margins of the tendon of the two longitudinal bundles

Between the circular and longitudinal muscle lies the intermuscular septum which consists of a thick layer of connective tissue containing Auerbach's plexus and a vascular network

The submucous layer The submucous layer of the œsophagus is continuous with that of the stomach and substances injected beneath the mucous membrane of one organ pass freely to the other In this layer are found small compound racemose glands which lie on the outer surface of the muscularis mucosæ Each of these glands opens on to the surface by a long duct

The blood vessels of the submucosa are larger and more numerous than those of the mucous membrane

FIG 7 —Transverse section through the thorax at the level of the fourth costal cartilage

R V Right ventricle *Tri V* Tricuspid valve *F Pl* Fatty fold in the pleura. *F Pm* Fat deep to the visceral layer of the pericardium. *R A* Right atrium *L A* Left atrium *V I V C* Valve of inferior vena cava. *I V C* Inferior vena cava. *R Ph N* Right phrenic nerve *L Ph N* Left phrenic nerve *M V* Mitral valve *G C V* Great cardiac vein. *Lc N* Lymph nodes *Ao.* Descending aorta. *V H* Vena hemiazygos *Th D* Thoracic duct *Œ* Œsophagus *V A* Vena azygos *Sc T* Sympathetic trunk *Lig Pulm* Ligamentum pulmonis.

Meissner's plexus lies in the submucous layer and appears to be devoid of ganglion cells

From a surgical point of view the most important constituent of this layer is perhaps the rich system of lymphatic channels

The internal or mucous coat The mucous membrane which is pink coloured at the upper end becomes paler lower down At the cardia it undergoes an abrupt change the smooth nearly white œsophageal epithelium giving place to the red uneven looking gastric mucosa

The line of junction encircles the lumen in a zig zag manner. Immediately below this line of junction is a groove into which the cardiac glands open. When the gullet is empty the mucous membrane is disposed in longitudinal folds.

The mucous membrane consists of

(1) Stratified squamous epithelium.

(2) Connective tissue, from which papillæ project into the epithelium.

FIG. 8.—Section through the disc between the ninth and tenth thoracic vertebræ behind and xiphisternal junction in front.

I.M.A. Internal mammary artery. *P.Pl.* [illegible] pleura. *P.Pm.* [illegible] the visceral pericardium. *T.V.* [illegible] the tricuspid [illegible] *R.A.* Right atrium. *C.S.* Coronary [illegible] *R.Ph.N.* Right phrenic nerve. *L.Ph.N.* Left phrenic nerve. *R.V.* Right ventricle. *L.V.* Left ventricle. *R.V.N.* Right vagus nerve. *L.V.N.* Left vagus nerve. *I.V.C.* Inferior vena cava. *Dia.* Diaphragm [illegible] *V.A.M.* Vena azygos [illegible] *Th.D.* Thoracic duct. *Œ.* Œsophagus. *Ao.* Descending thoracic aorta. *G.Sp.N.* Great splanchnic nerve. *S.T.* Sympathetic trunk. The part of pericardium is represented by a dotted line.

(3) The muscularis mucosæ, consisting of longitudinal unstriped muscle.

The epithelium.—This is thick and is composed of stratified squamous cells with numerous papillæ. At the cardia the squamous epithelium of the œsophagus meets the columnar epithelium of the stomach.

The connective tissue layer of the mucous membrane.—This is well developed and contains lymph follicles which lie at intervals of about

2 mm In the region of the cardia the arrangement of the connective tissue layer is disturbed by the cardiac glands which in infancy have the appearance of underdeveloped fundic glands It is said that these glands resume development after middle age and produce irregular masses of gland tissue

The muscularis mucosæ forms a thick layer and is composed of longitudinal bundles of smooth muscle fibres

Blood Supply

The blood supply of the œsophagus is derived from the inferior thyroid subclavian bronchial left gastric and inferior phrenic arteries and from the aorta

(1) *Cervical portion* This is supplied by branches from the inferior thyroid The branches on the left side are more numerous than those on the right

(2) *Thoracic portion* As far as the lower border of the arch of the aorta the blood supply is shared with that of the trachea

(i) *From the subclavian artery* The inconstant œsophageal artery of Lushka passes down to anastomose with the bronchial or œsophago-tracheal arteries The lowest branch of the inferior thyroid may take the place of Lushka s artery

(ii) *From the horizontal part of the arch of the aorta* The anterior œsophago-tracheal artery is a constant branch and passes to the groove between the trachea and the œsophagus

(iii) *From the bronchial arteries* There are usually one right and two left bronchial arteries Each bronchial artery supplies a slender ascending and a more substantial descending branch

(iv) *From the descending aorta* The posterior œsophago tracheal artery passes obliquely back to the posterior part of the œsophagus It is usually purely œsophageal

(v) *From the aorta* Between the levels of the fifth and seventh thoracic vertebræ two or three small vessels run obliquely down to the posterior surface

(vi) *From the aorta* At the level of the disc between the seventh and eighth thoracic vertebræ the great œsophageal artery passes down to 2 cm above the diaphragm where it anastomoses with branches of the left gastric and left inferior phrenic arteries

(3) *Abdominal portion* From the left gastric and left inferior phrenic arteries

The thoracic œsophagus has two relatively poorly vascularised areas: (i) about 2 cm. above the arch of the aorta, and (ii) from just *below the bronchial vessels to 3 cm. above the diaphragm.*

The œsophageal veins form a plexus, the upper parts draining into the systemic and the lower end into the portal system.

Lymphatic Drainage

Lymphatic vessels are numerous in the submucous layer, which is continuous with that of the stomach. Lymphatic vessels pass through the muscle coats of the gullet and run upwards and downwards in the *adventitia, where there are a few lymph nodes. The lymphatics in the adventitia pass freely to the lymph nodes of the posterior mediastinum and downwards to the lymph nodes along the lesser curvature of the stomach.*

Nerve Supply

The œsophagus has a dual nerve supply derived from the sympathetic and parasympathetic systems, the representatives of the latter being carried in the vagi and their branches. In the thorax the œsophagus is surrounded by the plexus gulæ, the plexus in the superior mediastinum being formed by branches of the right vagus and left recurrent laryngeal nerves, together with branches from the upper thoracic ganglia of the sympathetic chains. In the posterior mediastinum the plexus is formed by both vagi and by branches from the splanchnic nerves.

In the submucous layer of the œsophagus is Meissner's plexus, and between the longitudinal and circular coats of muscle lies Auerbach's plexus. *The former appears to be devoid of ganglia, whereas ganglia occur at the nodal points of Auerbach's plexus and are probably vagal in origin. Stimulation of the vagi produces contractions in the œsophagus, and division of the vagi produces a temporary spasm of the cardia. The action of the sympathetic is opposed to the vagal action.*

Sphincters of the Œsophagus

The œsophagus possesses two sphincters, an upper which is formed *by the cricopharyngeus muscle, and a cardiac sphincter, the nature of which is complex.*

The purpose of the upper sphincter of the œsophagus is to keep the

entrance to the gullet closed except during the passage of food or liquids and to prevent it filling up with air at each inspiration

The function of the lower or cardiac sphincter is to prevent the regurgitation of gastric contents into the œsophagus under normal conditions The precise method by which this function is fulfilled is still awaiting complete elucidation The anatomical features which are capable of producing sphincteric action in this situation are the lower end of the œsophagus itself the muscular fibres of the diaphragm and the nature of the insertion of the œsophagus into the stomach

As regards the lower end of the œsophagus itself there is no reason why the circular muscle in this situation should not exercise the function of a sphincter but the absence of any associated dilator fibres suggests that any such action is probably incidental

In its passage through the œsophageal hiatus of the diaphragm the gullet is embraced by the muscular fibres of the right crus which are placed in such a way as to be capable of producing a sphincteric effect and in fact may well play a part comparable with that of the levator ani in respect of the anorectal junction

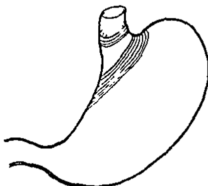


FIG 9 —Diagram showing the sling like arrangement of the oblique muscle fibres at the incisura cardiaca

The most important factor in the production of the cardiac sphincter is the nature of the insertion of the œsophagus into the stomach Emerging from the diaphragm the œsophagus curves slightly to the left to reach the cardiac orifice of the stomach This part of the œsophagus which in the human adult measures about 2 cm in length is termed the cardiac antrum At the cardiac orifice the right border of the œsophagus passes smoothly on to the lesser curvature of the stomach the left border however forms an acute angle with the stomach This angle is known as the incisura cardiaca This acute angle is capable of still further diminution by the action of the oblique muscle fibres of the stomach These fibres are arranged in the form of a sling the ends of which merge with the lesser curvature, while the curved part of the sling passes over the incisura It seems clear that this arrangement of the oblique muscle fibres constitutes a mechanism

for closing the lower end of the œsophagus. Provided that the mechanism is functioning properly, distension of the fundus will serve to reinforce the closure of the sphincter (Fig. 9).

Average Œsophageal Measurements in the Adult Male

Distance from the upper sphincter to the cardiac orifice	25 cm
Distance from the anterior alveolar margin to the upper œsophageal sphincter	15 cm
Distance from the anterior alveolar margin to the left bronchus	25 cm
Distance from the anterior alveolar margin to the cardiac orifice of the stomach	40 cm
Greatest diameter when empty	20 mm
Greatest diameter when moderately distended	24 mm

The Physiology of Swallowing

The initial stages of swallowing are voluntary and are concerned with masticating the food, mixing it with saliva and forming it into a bolus which is then passed to the back of the mouth by elevating the front of the tongue. Contraction of the mylohyoids forces the bolus backwards between the pillars of the fauces. The remaining stages are involuntary and depend upon a series of properly co-ordinated reflex actions.

The posterior wall of the pharynx, the soft palate and the epiglottis are concerned with the initiation of a complex series of reflex actions. The mechanical stimulation of sensitive spots on these structures sets up afferent impulses which pass to the medullary centres. The sensory supply of the posterior pharyngeal wall is derived from the glossopharyngeal nerve, the soft palate is supplied from the ninth and the second division of the fifth, and the epiglottis from the superior laryngeal.

The co-ordinated reflex movements which result from these stimuli are as follows:

(1) The soft palate is raised and the posterior pharyngeal wall moves forward to shut off the posterior nares.

(2) The posterior pillars of the fauces approximate to shut off the mouth.

(3) The vocal cords approximate and the larynx is drawn upwards against the base of the tongue.

(4) Respiration is inhibited

(5) Contraction of the upper pharyngeal muscles together with relaxation of the upper œsophageal sphincter propels the bolus into the œsophagus with some force

The subsequent passage of the bolus down the œsophagus in the absence of any mechanical obstruction depends very largely on the proper co-ordination of the movements which have been so far described

Substances which trickle down the œsophagus without being swallowed do not initiate the reflex and accumulate in the gullet This occurs in cases of pharyngitis and post nasal infections when mucus may collect in the œsophagus during the night

The smooth launching of the bolus which is so important may be interfered with in a number of ways Lesions of the medulla or of the ninth or tenth cranial nerves or any local condition which impairs the sensation of the pharyngeal wall or soft palate will upset the reflex and may result in the regurgitation of food into the nose or aspiration of food into the larynx

Painful conditions in any of the structures concerned may prevent the bolus from entering the upper œsophagus with that degree of assurance which seems necessary to initiate the further movements which carry the bolus on into the stomach

The entrance into the œsophagus is guarded by the upper sphincter formed by the fibres of the crico-pharyngeus muscle and whose purpose it is to prevent air passing into the gullet with each inspiration

If the neuro muscular mechanism is acting normally the upper sphincter opens up before the bolus which then enters the œsophagus propelled by the powerful pharyngeal muscles

Once in the œsophagus the passage of the bolus is assisted by peristaltic movements and to a lesser extent by gravity The important factors determining the passage through the œsophagus are the initial force of entry and the proper relaxation before the advancing bolus Three forms of muscular action occur in the normal œsophagus

(1) *Primary wave* This wave is initiated by deglutition and starts at the upper end of the œsophagus where the muscle fibres are striated It is a true peristaltic wave and is preceded by a wave of relaxation It flows without interruption from the upper end of the gullet to the cardia

(2) *Secondary wave* This arises at the level of the aortic arch where the striated muscle fibres of the upper œsophagus give place to the

smooth fibres of the lower two-thirds. It is initiated by distension of the gullet and is seen when the primary wave has failed to carry the bolus the whole length of the œsophagus. It is less powerful than the primary wave.

(3) *Localised or tertiary contractions.* These arise in the smooth muscle of the lower two-thirds of the œsophagus and although seen frequently in the older age groups are not often observed in younger people. Several contractions may appear simultaneously and may last for several seconds. They have no propulsive effect on the bolus and their importance lies in the fact that they may lead to errors in diagnosis.

Reverse peristalsis may occur.

The bolus of food normally takes about 5 sec. to reach the lower end of the œsophagus where it is checked by the cardiac sphincter. There is some variation in the time taken to pass through the cardiac sphincter even in the normal subject, but in general the hold up is momentary and the bolus of food is quickly passed into the stomach.

As soon as the œsophagus is empty the cardiac sphincter closes firmly and prevents the regurgitation of gastric contents.

The smooth working of the peristaltic waves and the relaxation of the cardiac sphincter are dependent upon vagal and sympathetic innervation, and any imbalance between them will produce neuro-muscular disturbances. The nature of these is considered later.

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CHAPTER II

THE OESOPHAGUS: NORMAL AND ABNORMAL DEVELOPMENT: CONGENITAL ATRESIA

The œsophagus, in common with the larynx and trachea, is developed from the primitive foregut. Two lateral grooves appear which run in a longitudinal direction. These grooves represent internal ridges which meet and join and so separate the trachea and larynx from the œsophagus. The fusion of these two lateral ridges starts in the region

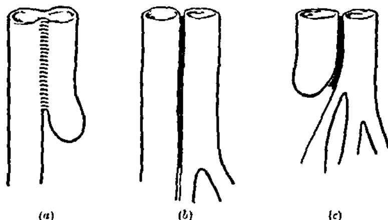


Fig. 10.—Development of the œsophagus.

(a) Separation of the œsophagus from the rest of the primitive foregut by the formation of the two longitudinal ridges.
(b) Fusion of the longitudinal ridges at the sixth week of intra-uterine life.
(c) The fusion has occurred in an oblique manner with the result that the upper part of the œsophagus forms a blind sac and the lower part communicates with the trachea.

of the lung bud and proceeds towards the head. Fusion is normally completed between the fifth and sixth week of intra-uterine life.

If the lower ends of the ridges lie in an oblique position their fusion will result in the upper part of the œsophagus being cut off to form a blind sac. At the same time the lower part of the œsophagus will be left to open into the trachea. This anomaly constitutes the most

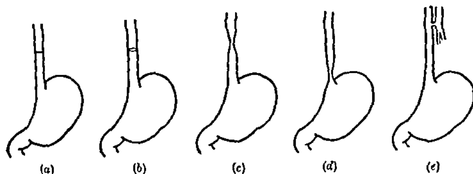


FIG 11 —Rare anomalies

(a) Complete septum.
(b) Incomplete septum.
(c) and (d) Varying degrees of narrowing
(e) Fistula between œsophagus and trachea without atres

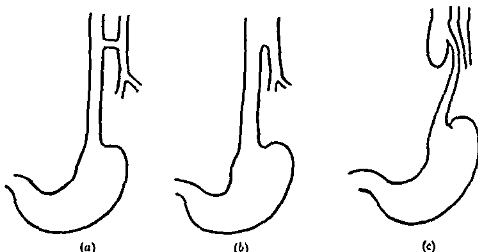


FIG 12 —Post-mortem specimen showing cleft like deficiency between the œsophagus trachea and larynx

important variety of congenital atresia of the œsophagus and is discussed more fully below (Fig 10)

Most of the other abnormalities which are met with can be accounted for by *incomplete or irregular fusions of the two lateral ridges*

Amongst these rare anomalies are the presence of a septum which may be complete or incomplete and varying degrees of narrowing of the œsophagus (Fig 11) Very rarely a communication exists between the œsophagus and trachea without there being any other abnormality in either structure This communication may consist of a hole (Cameron Haight), or a cleft like deficiency throwing the upper



(*a*) (*b*) (c)

FIG 13—Rare anomalies

(*a*) Fistula between œsophagus and trachea without atresia (Cameron Haight).
(*b*) Cleft like deficiency (O Reilly).
(*c*) Diverticulum of upper part of œsophagus (O Bannon).

part of the œsophagus into the trachea (O Reilly) (Fig 12) Another anomaly which has been described (O Bannon) is that in which the upper part of the œsophagus forms a diverticulum from which the lower part emerges by a narrow communication (Fig 13)

An *anomaly of a different character* has been described and has excited much interest This is the so-called congenital short œsophagus in which part of the stomach lies above the diaphragm (Fig 14) Such a condition may occur in very rare instances but it seems probable that the shortening of the œsophagus is usually a secondary phenomenon associated with ulceration at the *lower end of* the œsophagus This ulceration or œsophagitis is caused by regurgita

tion from the stomach resulting from failure of the sphincteric mechanism at the cardia

Some cases of so called congenital stricture of the lower end of the œsophagus fall more properly into this group (see Chapter IX)

Congenital Atresia of the Œsophagus

Historical note Gibson who was a grandson of Oliver Cromwell and Physician General to the Army described this condition in 1697 but some 250 years elapsed before successful methods of management were devised and carried out A case report was published in 1821 by Martin and in 1884 MacKenzie collected records of forty three cases

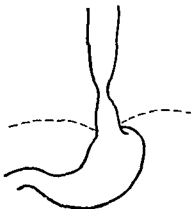


FIG 14 —Short œsophagus

The œsophago gast c junction lies bove the di phr gm

In 1910 Sir Arthur Keith found fourteen examples of atresia in the museums of London and gave an accurate description of what we now know to be the most usual type The belief that the condition is very rare and that when it occurs it is nearly always accompanied by other serious malformations has discouraged attempts at treatment It is quite true that other abnormalities particularly imperforate anus may be associated with atresia but it must be remembered that in forty five consecutive cases Cameron Haight found only one patient with an additional deformity which was incompatible with life Most authors have commented on the extreme rarity of the condition—the popular figure given being one in 50 000 births Guthrie (1945) searching the material at the Royal Hospital for Sick Children Glasgow found that between 1915 and 1944 in 6 916 consecutive post mortem examinations malformations of the œsophagus were found in thirty eight subjects and no fewer than twenty four of these provided examples of atresia (one in 284 autopsies) Six other patients who did not come to autopsy presented suggestive clinical features

At the Postgraduate Medical School of London from 1935 to 1942 four cases of atresia were found in 10 513 deliveries or one in 2 633 deliveries When it is considered that nearly every one of the autopsy cases investigated by Guthrie showed pulmonary complications of great severity it is reasonable to assume that a number of these

infants succumb without the true nature of the lesion being suspected

Types of Atresia

The different types of atresia were classified by Vogt in 1929 as follows (Fig. 15)

Type I Complete absence of the œsophagus

Type II Atresia of the œsophagus with an upper and lower œsophageal segment each ending in a blind pouch

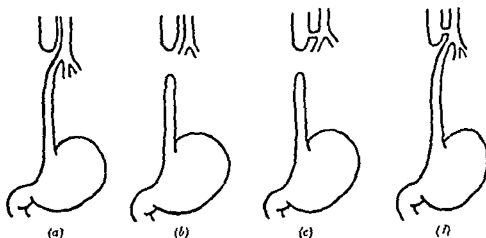


Fig. 15.—Types of congenital atresia

(a) The most common type (Type III (b) according to Vogt [illegible]) 80 per cent of all cases fall [illegible] group
(b) Vogt's Type II [illegible]
(c) and (d) Rare types of atresia Type III (a) and III (c)

Type III Atresia of the œsophagus with tracheo-œsophageal fistula

(*a*) With fistula between upper segment and trachea
(*b*) With fistula between lower segment and trachea
(*c*) With fistula between both segments and trachea

Eighty per cent of all cases of atresia are of the Type III (*b*)

The upper segment ends blindly at about the level of the vena azygos arch or 10–12 cm from the anterior alveolar margin; it is dilated and hypertrophied and remarkably constant in size and shape.

The lower segment shows more variation; it springs from the back of the trachea, usually within 1 cm of the bifurcation, or from the

bifurcation itself within these limits it varies considerably so that it may overlap the upper segment or it may be separated from it

The lower segment is nearly always thin walled and usually about half the calibre of the upper segment

It may be of nearly uniform diameter throughout its length or it may taper as it approaches the trachea

These characteristics and variations are of great importance in determining the feasibility of anastomosis

The Surgical Problem

Any attempt at feeding fills the blind upper segment so that its contents spill over into the trachea to evoke attacks of cyanosis and before long aspiration pneumonia Even if feeding is avoided the blind upper sac fills with mucus and saliva unless kept empty by frequent aspiration If a gastrostomy has been carried out with the hope of relieving the condition the feeds will find their way into the lungs through the distal œsophagus and its tracheal fistula unless the anomaly is of the uncommon type in which there is a blind lower segment

In addition to the fact that gastric contents may enter the lungs with fatal results air may pass the other way and cause considerable gastric distension A type of spurious respiration may sometimes be observed air passing backwards and forwards between the lungs and the stomach by way of the fistula This gastric respiration produces anoxia

The Evolution of the Operative Treatment

Steele carried out gastrostomy in 1888 and others followed his example but all these attempts were unsuccessful because of the regurgitation into the lungs

Brenneman (1918) hoped to overcome this difficulty by substituting a jejunostomy for gastrostomy but again without success

Richter in 1913 recognised the importance of the fistula and advocated transpleural ligature of the lower œsophagus together with gastrostomy His two cases were unsuccessful and it must be noted that he made no provision for keeping the blind upper segment empty Direct anastomosis by means of the Murphy button was advocated by Von Hacker in 1926 (quoted by Lanman 1940) but without success

There was a gradual realisation of the nature of the problem and its solution was seen to be dependent on

(1) Keeping the blind upper segment empty
(2) preventing regurgitation through the fistula into the trachea
(3) successful feeding of the infant

All sorts of methods were adopted to achieve these results and the names of Mixter, Leven Gage and Ochsner Gamble and Ladd are all associated with multiple operations which include cervical œsophagostomy various types of gastrostomy transection of the stomach and ligature of the fistula Out of all these attempts only two were completely successful at this time the staged operations performed by Ladd in 1939 and Leven in 1940

Primary anastomosis was attempted by Lanman in 1936, but none of his patients survived

In 1941 Haight and Townsley were able to report the first completely successful direct anastomosis carried out by the extra pleural route

The advantages of the extra pleural operation are borne out by the fact that in 1946 Haight was able to report the following results

Haight s Results to 1946

15 consecutive patients
12 had associated tracheo-œsophageal fistula, one additional patient had a tracheo-œsophageal fistula without œsophageal atresia
36 patients were explored
26 patients were submitted to intra thoracic restoration of œsophagus
9 patients survived operation from six months to four and three-quarter years

Only one patient in this series had an additional anomaly which was incompatible with life

Ladd's Results to 1944

34 patients explored
28 patients submitted to a staged operation nine living
6 patients treated by primary anastomosis two living

Ladd s first success was a staged operation in November 1939 an ante-thoracic œsophagus was constructed and the child was reported alive at the age of four and a half years

Ladd and Swenson's Results reported in 1947

Out of a series of fourteen patients treated by primary anastomosis there has been only one death

The first recorded successes outside the United States were those of the author who at the time of writing has had eleven successful cases following primary anastomosis

Diagnosis

Cyanosis associated with excess of mucus in the nasopharynx may be noted at birth in many normal infants A single aspiration is usually sufficient to effect an immediate improvement

If the condition recurs an hour or two later the possibility of an œsophageal atresia should be considered

When feeds are started all the symptoms are accentuated the child is often avid for its feed and sucks strongly only to be overwhelmed by an attack of spluttering and cyanosis The feed is regurgitated and when this has taken place all the signs may disappear until the next feed is attempted This sequence of events is usually sufficiently striking to attract notice but the symptoms are only too often attributed to other causes such as tentorial tears or atelectasis

Midwives and others who have the care of infants in the first hours of life should be taught that œsophageal atresia is the commonest cause of persistent choking and cyanosis in the new born child

Once the suspicion of atresia has been raised all mouth feeding is stopped and the nasopharynx is aspirated at frequent intervals

The Confirmation of the Diagnosis

A well lubricated rubber catheter is passed through the mouth and



FIG 16—The first step in the diagnosis of œsophageal atresia

A well lubricated rubber catheter is introduced through the mouth and its arrest 10–12 cm from the alveolar margin is almost diagnostic of the condition.

down the œsophagus Its arrest 10 12 cm from the alveolar margins is practically diagnostic of atresia (Fig 16) If the catheter is too fine



FIG. 17.—Radiograph of an early case showing aspiration of the opaque medium into the lungs.

The medium has been passed down the [illegible] [illegible]. The [illegible] was [illegible] [illegible] the death of the [illegible] a few days later.

or too soft it may curl back from the end of the blind sac and give rise to a mistake in diagnosis

Final confirmation of the diagnosis is radiological but the practice of giving a barium swallow is to be condemned The emulsion is almost certain to spill over into the lungs and the child s slender chance of survival is still further reduced (Fig 17) Apart from the danger

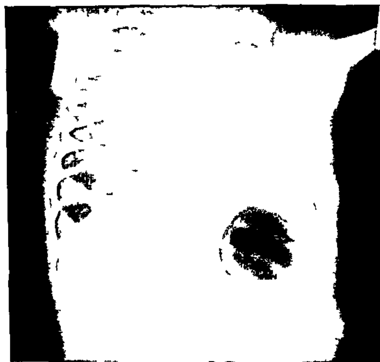


FIG 18 —The opaque medium is apparently passing normally down the œsophagus

Atres w in f ct present the i bsed o l h g spilled ov r into th tra h nd out thro gh th f t l into the l w r segment F rtunat ly the correct di gn sis was mad nd ope t on rried out Th h l l n w o r three ye rs ld.

associated with this technique mistakes in diagnosis may result as is shown in the accompanying X ray If the diagnosis had been made on the X ray film alone the œsophagus might have been passed as normal owing to the fact that opaque material has spilled over into the trachea out through the fistula and down the lower œsophageal segment giving the impression on the film of a continuous shadow down the œsophagus (Fig 18)

The best method to adopt is the following

The infant is screened and a careful assessment is made of the condition of the lungs the stomach and intestines are then examined for the presence of air (Fig 19)



Fig 19 —The presence of air in the stomach and intestine indicates that if atresia is present the deformity must be Type III (b)

If air is present in the stomach and intestines below an œsophageal atresia it is proof that a fistula exists between the lower segment and trachea The converse is usually but not invariably true

A catheter is now passed into the upper segment and ½ c c of iodised oil is gently introduced under direct observation (Fig 20)



Fig 20—The introduction of 0 5 c c of iodised oil confirms the presence of a blind upper segment

Spill over into the lungs has been avoided. The infant made a good recovery following operation.

The appearance of the blind segment is characteristic and as soon as it has been observed and the rare presence of a fistula in the upper segment excluded the iodised oil is withdrawn (Figs 21, 22 and 23)

Broncho copic examination has been used to inspect the fistula and so confirm the diagnosis (Pilcher) and this method should be u ed in the extremely rare event of there being a fistula between an otherwise normal œsophagus and trachea



Fig 21 —Blind upper segment Air in stomach an l

Apart from the passage of a catheter into the blind aspiration the important features in the management sta, are negative rather than positive The chief sa

the avoidance of any further feeding and of unskilled attempts at X ray diagnosis

Management after the Diagnosis has been Confirmed

The complete diagnosis not only confirms the presence of atresia, but in many cases discloses the precise nature of the deformity It



Fig. 2 —Blind upper segment No air in stomach or intestines Type II

must be emphasised again that 80 per cent of the cases fall into the characteristic group in which there is a fistula between the trachea and the lower oesophageal segment

The preparation of the patient for operation requires the full collaboration of an expert paediatrician as well as the whole-time service

of an intelligent and conscientious nurse In fact without these two essentials before and after operation any surgical intervention is almost certain to fail



Fig 23 —Type III (b) The child made a good recovery following operation and is now three years old He appears to be normal in every respect

The three essentials in the pre-operative period are to keep the blind sac empty by aspiration to improve the state of the lung by changing the child's position frequently and systematically and to

administer the requisite fluid parenterally The fluid requirement may be difficult to assess and giving too much is probably more dangerous than giving too little

The Operation

A general anæsthetic administered through an endotracheal tube should be given except in the case of very small infants when local anæsthesia (Procaine 1 per cent) should be used

The child is secured in a prone position over a rubber hot water bottle half filled with warm water A small pad is placed under the right shoulder and the head is turned to the right

The incision is curved starting over the second right rib 1 cm lateral to the spine and passing downwards parallel to the spine over the third and fourth ribs and then outwards crossing the fifth rib obliquely and ending over the sixth rib (Fig 24)

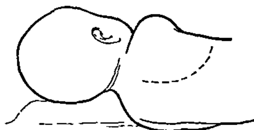


FIG 24 —The line of the skin incision in the extra pleural operation

Part of the fifth rib is resected sub periosteally extreme care being necessary to avoid opening the pleura

The correct extra pleural plane having been found the fourth third and second ribs are divided together with the corresponding intercostal bundles The pleura is carefully displaced until the vena azygos arch is seen This usually marks the lower end of the blind upper segment and if it is in the way it is divided between silk ligatures with great care Gentle movement of the catheter in the upper segment helps in its identification (Fig 25)

The lower œsophageal segment arises from the posterior surface of the trachea or from the bifurcation itself The fistula is ligatured with silk as close as possible to the trachea and divided taking care to conserve as much as possible of the lower segment

Traction sutures are introduced into each segment to avoid unnecessary handling

Anastomosis is undertaken if it seems feasible to do so without undue tension and it is carried out with fine sutures on small curved eyeless round bodied needles

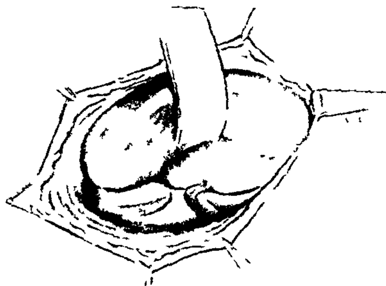


FIG 25—The pleura and lung have been displaced and the vena arch brought into view

The end of the upper segment is seen just above the arch and the lower segment under the ... t ... r the trachea. The difference in ... of the ... segment noted.

Various methods of anastomosis have been described but them is easy When possible the telescopic method of Haight should be adopted The whole thickness of the lower

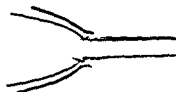


FIG ... — Cameron Haight's telescopic method of anas...

is sutured to the mucous membrane of the upper segment muscle of the upper segment to surround the line of ana... a cuff (Fig 26)

The structures are delicate and readily damaged and th

tendency for the stitches to cut out It is best to rely on a few interrupted sutures and not to attempt too elaborate an anastomosis

After the first few stitches have been tied considerable help is obtained by pushing the catheter gently down from the pharynx into the lower œsophagus and completing the anastomosis over the tube During this procedure the opportunity is taken of aspirating the air from the stomach (Fig 27)

On completing the anastomosis the area is well dusted with penicillin

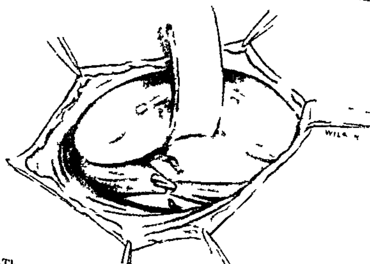


Fig 27 —The vena azygos arch has been divided the posterior part of the anastomosis effected and the rubber catheter has been advanced into the stomach to facilitate the completion of the anastomosis

powder the wound closed around a small under water drain and the œsophageal tube removed

After-care

The child is nursed in an oxygen tent and the same care is taken to aspirate the nasopharynx as before operation

The fluid and salt balance must be controlled with great care and is best entrusted to a skilled pædiatrician

Hourly feeds of penicillin (10 000 units) may be started twelve hours after the operation and the mediastinal drainage tube removed on the second or third day Before removing the tube the patency of the



Fig. 28.—Barium swallow two years after a successful operation for oesophageal atresia with fistula

A considerable leak occurred post-operatively and a gastrostomy was carried out. The child is now four years old and appears to be normal in every respect.

œsophagus is tested radiologically with iodised oil. If the reconstructed œsophagus conducts the oil without leakage feeds of expressed breast milk are begun. If the radiological examination demonstrates a considerable leak it is best to carry out a gastrostomy on the fifth or sixth day (Figs 28 and 29).

If anastomosis has proved impossible the first stage of a multiple-

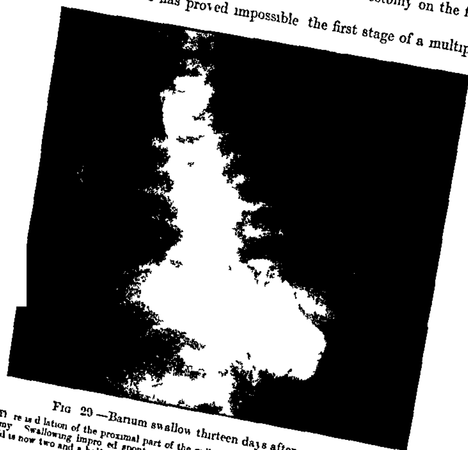


FIG 29.—Barium swallow thirteen days after operation.
There is dilatation of the proximal part of the gullet and feeding difficulties necessitated gastrostomy. Swallowing improved spontaneously and the gastrostomy was allowed to close. The child is now two and a half years old. Treatment by dilatation may be required later.

stage operation may be carried out (Humphreys). A finger is passed along the back of the trachea into the base of the neck near the suprasternal notch. An incision is made between the right sternomastoid and the trachea and through this the upper segment is drawn to establish a cervical œsophagostomy.

If a fistula is present it is ligatured and divided at this first stage but failure to effect an anastomosis may be due to the absence of a



Fig 28 —Barium swallow two years after a successful operation for œsophageal atresia with fistula

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FIG. 29.—Barium swallow thirteen days after operation.

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If a fistula is present, it is ligatured and divided at this first stage, but failure to effect an anastomosis may be due to the absence of a

fistula, the blind ends of the œsophagus being further apart in Type II than when a tracheo œsophageal fistula is present

Rather than embark on a multiple-stage operation, Rienhoff has brought the stomach up under the skin in front of the chest and anastomosed it to the cervical œsophagus

It may be found impossible to bring the stomach up to the cervical œsophagus by the subcutaneous route and, if such be the case the subsequent growth of the child may make the completion of the anterior thoracic œsophagus a procedure of some magnitude (Figs 30 and 31)

Another method of correcting this type of anomaly is to mobilise the stomach through a left sided abdomino thoracic incision and to anastomose it to the blind upper segment, above the arch of the aorta

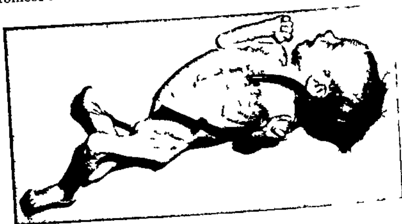


Fig 30—Type II Atresia

An unsuccessful attempt was made to bring the stomach up to the cervical œsophagus by the subcutaneous route The child lived for some weeks but finally died of aspiration pneumonia.

This method was used by the author in the case of a premature infant weighing only 3½ lb The child died within thirty six hours but the anastomosis was satisfactory and there seems to be no reason why the method should not prove successful

Early and accurate diagnosis the avoidance of harmful procedures such as ill conceived X ray examinations and a thorough understanding of the precise nature of the abnormality are the essential prerequisites to progress If these essential preliminaries are followed by meticulous surgery modern anaesthesia the use of antibiotics and above all by unremitting post operative nursing care there is no reason why even these apparently unfavourable types of atresia should not become amenable to surgical treatment

An important question of surgical technique which affects all types of œsophageal atresia is still *sub judice* namely that of extra pleural or trans pleural approach Until quite recently it is true to say that whereas the extra pleural operation has been followed by an increasing number of successes the results of the trans pleural operation have been uniformly unsuccessful The recent series recorded by Belsey

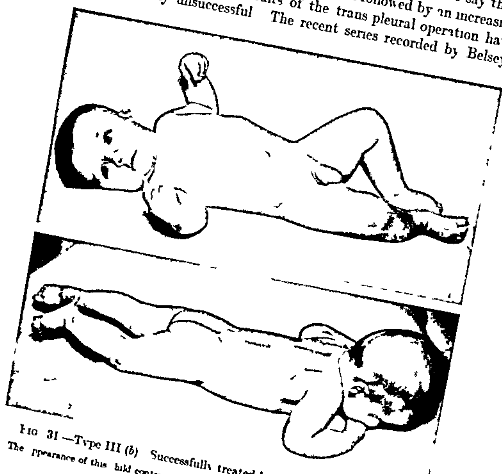


FIG 31—Type III (*b*) Successfully treated by primary anastomosis
The appearance of this child contrasts strongly with the pitiful state of the child in Fig 30

however consists of ten infants operated upon by the trans pleural route and of these five have recovered

The author and others started by carrying out the trans pleural operation but abandoned it in favour of the more tedious extra pleural method because it was felt that the lack of success following the early trans pleural operations was due to the liability of the

anastomosis to leak An intra pleural leak appeared to be fatal to a small infant, whereas an extra pleural leak might be no more than a temporary embarrassment

It must be remembered, however that neither the antibiotics nor refinements in anaesthesia for infants were available when these early cases were being attempted It may well be that the help afforded by these two advances has made the trans pleural approach less hazardous Belsey stresses the importance of securing a good blood supply at the anastomosis by cautiously trimming down the lower segment, and this step is certainly carried out with less difficulty if the chest has been opened widely Judgement must be reserved in this difficult matter until further material is available for assessing the relative value of the two operations *

* Recent experience has inclined me to the view that the tran pleural operation is to be preferred

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CHAPTER III

THE INVESTIGATION OF DYSPHAGIA IN THE ADULT GENERAL CONSIDERATIONS

Dysphagia is such a striking symptom that very few patients allow the condition to persist without seeking medical advice However, in the past there has been an unfortunate tendency to regard dysphagia as being due either to some sort of spasm which is not of a serious nature or on the other hand to carcinoma which offers little prospect of successful treatment The result of this attitude has often been to deny these patients any treatment until the condition has become advanced

It should be emphasised that dysphagia is a symptom which may be of very grave significance and steps must be taken at the very earliest stage to make an accurate diagnosis of the cause With the advance of knowledge a considerable number of non malignant causes can be recognised which are amenable to treatment and in the case of malignant disease surgery has very much more to offer these patients than it had even a few years ago

It is very important to distinguish between difficulties of deglutition and dysphagia proper The former may occur in any local disease of the mouth pharynx or larynx It may be associated with bulbar palsy A carcinoma at the base of the tongue may give a history which at first may suggest a lesion of the œsophagus but which on further examination is quite clearly a difficulty of deglutition

The previous history may throw some light on the present condition a corrosive injury or the story of a peptic ulcer associated with heart burn suggests a possibility of simple stricture Similarly an impacted foreign body or the methods used to remove it may have resulted in damage to the œsophagus with subsequent narrowing Enquiries should be made as to any dysphagic symptoms which may have occurred in infancy or during childhood

The nature of the onset often gives an indication of the correct diagnosis if drinking is first affected and if complete remissions have occurred the trouble is likely to have been spastic in the first instance



cinoma of the oesophagus occurring in a patient who had suffered from symptoms of achalasia throughout life

This is particularly the case if the history extends over a long period of time but it must be remembered that malignant disease may be superimposed on some simple condition which has been present for many years The history of an impacted foreign body should always be considered carefully because the nature of the foreign body may have been such as would easily have negotiated the normal œsophagus Further investigation of such a case may disclose the presence of an unsuspected stricture Periods of remission are usually regarded as evidence that the underlying cause is non malignant and this is usually true if the remission of symptoms is complete and if it occurs several times The significance of the remission should be interpreted with caution because many patients suffering from cancer of the œsophagus give an initial history of dysphagia which may disappear for several weeks only to recur at the end of this time This is particularly liable to happen if the growth starts at the cardiac end of the stomach In these circumstances the malignant cells as they creep up to the lower end of the œsophagus sometimes cause a neuro muscular imbalance which may produce spasm Later on as the malignant invasion pro gresses the œsophagus may be held open by the rigid nature of the growth and the patient s symptoms may disappear and lead to the erroneous conclusion that the whole trouble was nothing more than some transient spasm Still later possibly after the lapse of several weeks the growth produces an organic obstruction and the diagnosis becomes obvious

The patient s estimate of the site of obstruction can seldom be relied upon to indicate the level of the lesion On the other hand if pain is an accompaniment the localisation of this by the patient is often of considerable accuracy

Certain features such as gurgling noises and fullness in the neck may suggest a pharyngeal pouch and lead to a correct diagnosis without difficulty

An important simple method is that of watching the patient eat and drink If dysphagia is incomplete and has been developing for a long time the patient may tend to minimise the trouble and it is only when the process of swallowing is observed that a true assessment of the disability can be obtained

General Examination

Wasting which may be extreme is often the only abnormal finding A careful examination must however always be made and occasionally

a malignant lymph node may be discovered at the root of the neck on the left side, or the liver may be found to be enlarged Sometimes an abnormal mass reveals a cancer of the stomach as the starting point of the trouble Occasionally the presence of secondary malignant nodules felt on rectal examination may make the diagnosis only too obvious

In most cases investigation depends upon special methods and of these the first should be X ray examination with a barium swallow If this method is carried out by an expert it is usually possible to say whether the dysphagia is due to causes outside the œsophagus or in the œsophagus itself either in the form of a neuro muscular inco-ordination or as an organic obstructing lesion It is usually necessary to employ media of different consistencies and to make use of the Trendelenberg position in order to show the lower limit of the lesion In many cases the X ray examination alone is quite conclusive although confirmation by œsophagoscopy is usually required This examination is of the greatest importance and it must always be used in the case of patients who complain of dysphagia, but who do not show any obvious disease on X ray examination

Œsophagoscopy is potentially a very dangerous procedure and should be carried out with the greatest care (see Chapter IV) Other useful methods of investigation are the examination of the stool for *occult blood* and *hæmoglobin and red cell estimations*

CHAPTER IV

ŒSOPHAGOSCOPY

Historical Note

Early attempts at œsophagoscopy were made by Semeleder and Stoerk in 1866 The instrument used was a forceps with spoon shaped blades Semeleder designed the instrument and had the courage to offer himself to Stoerk for experiment After the instrument had been introduced a laryngeal mirror was used to inspect the interior of the œsophagus The plan failed however because mucous membrane projected between each blade of the forceps and obscured the view

In 1868 Bevan illustrated a tube 4 in long and ¾ in in diameter having a larger bore ring about 1 in long attached to its upper end at an angle of about 45 Some form of reflector was evidently en visaged This instrument does not appear to have been applied practically and Mackenzie dismisses the invention as being the result of work in the library rather than in the wards of a hospital

Walderburg devised a gum elastic tube connected to a two-pronged fork which was used in conjunction with a laryngeal mirror Later Walderburg modified the instrument so that it consisted of two metal tubes each about 6 cm long arranged telescopically This instrument was demonstrated by Stoerk before the Society of Physicians of Vienna in about 1871

Mackenzie brought out an instrument in 1880 which consisted of a skeleton speculum which was opened up after the instrument was in position in the œsophagus

In 1881 Mikulicz used electric light to help in the examination of the gullet

Modern Types of Œsophagoscope

The three types of instrument in most common use at the present time are the following

(1) Kahler Haslinger which depend on proximal illumination

(2) Chevalier Jackson which has distal lighting
(3) Negus this instrument has two lamps set obliquely in the walls of the tube at the proximal end

Apart from the difference in illumination Jackson s instruments are the narrowest of the three types described Kahler s and Haslinger s are intermediate in size and those recommended by Negus are of a wider bore

The instruments designed by Negus can be strongly recommended Those commonly used have the following measurements

Children	internal diameter 10 × 8 mm
	external circumference 35 mm
	length 35 cm
Adults	internal diameter 17 6 × 15 6 mm
	external circumference 60 mm
	length, 45 cm

It is also convenient to have an instrument for adults of the same bore as the above but only 35 cm in length when the middle part of the œsophagus is known to be the level at which the examination is to be made For inspection and treatment of conditions at the mouth of the œsophagus Negus employs a wide speculum of the Jackson type fitted with the twin proximal lights of his own design

Other Instruments Required

It is essential to have a dependable aspirator at hand Other instruments which are required depend upon the nature of the condition for which the examination is being made and include biopsy forceps bougies for dilatation forceps and cutting instruments for removing foreign bodies and a large bore instrument for the introduction of Souttar s tubes

General Remarks on Œsophagoscopy

It must be emphasised that œsophagoscopy is potentially a very *dangerous examination and it should on no account be carried out by* the inexperienced surgeon The injuries which may occur as a result of the careless use of the instrument are perforation or severe bruising of the œsophageal wall paralysis due to pressure on the recurrent laryngeal nerve and injuries to the crico-arytenoid joint In addition to these possible injuries the presence of an aortic aneurysm is an absolute contra indication to œsophagoscopy because the risk of

rupture is a very real one Injuries may also occur at the site of the lesion which is being inspected If intubation is being carried out for a carcinoma there is always a risk of producing an injury at this point and particular gentleness must be used This particular danger is one which must sometimes be faced During the removal of a foreign body injury may be produced by rough extraction

In general it is wise not to carry out œsophagoscopy in cases of corrosive injury for several weeks after the accident but the experience of the surgeon may in certain circumstances enable this to be done with safety at an earlier stage X ray examination must always precede œsophagoscopy

Technique of Œsophagoscopy

Œsophagoscopy can be carried out under local anæsthesia or in very expert hands with no anæsthesia at all However in general it is much more satisfactory to have the complete relaxation given by a good anæsthetic administered through an endotracheal tube and supplemented by relaxants

The anæsthetised patient is placed with his head over the end of the table The patient s head is supported by an assistant whose task is made easier if a footstool is provided If a table with an easily adjustable head rest is available this may be used instead This position with the shoulders projecting far enough to allow half the scapulæ to extend beyond the end of the table is known as Boyce s position (Fig 32) It is best to introduce the instrument through the side of the mouth guiding the distal end with the left hand and keeping the neck flexed in the first stages The epiglottis is seen and the instrument is directed to the right pyriform fos a and then guided towards the mid line so that the beak of the instrument presses gently on the back of the cricoid cartilage This is the difficult part of the introduction and no force must be used as it is very easy to damage the posterior pharyngeal wall particularly if the neck is extended and especially in those cases in which cervical spurs are present (see Instrumental Injuries) The upper sphincter of the œsophagus should now come into view and may be seen to relax when the instrument can be insinuated into the upper end of the œsophagus Thereafter the passage of the instrument should be comparatively easy provided that the lumen is kept in the middle of the field of the œsophagoscope This is achieved by altering the position of the patient s head and shoulders

Indications for Œsophagoscopy

(1) *Extraction of foreign bodies* Early and skilful œsophagoscopy should be regarded as essential in the management of impacted foreign bodies By this means foreign bodies can be removed safely in nearly every case



Fig 32—Œsophagoscopy
The assistant has good control of the head. Note the [illegible]

The proper sense of urgency which is evoked by this accident must not lead to ill advised attempts at removal It is far better to delay treatment for a few hours until the patient can be transferred to a centre where the necessary skill and equipment are available

X ray examination just before the œsophagoscope is passed will

often show the level of impaction and the nature of the foreign body if this is not already known If an object can be obtained which is identical with the one which is impacted it should be used to determine the best forceps to employ and the safest method of extraction When this knowledge has been gained it can be applied to the actual problem in hand

Preliminary trial with an identical object has been practised to perfection by Chevalier Jackson to whose work the reader is referred

The presence of a foreign body which is not opaque to the X ray may often be shown by administering a barium swallow while screening the patient A foreign body which is momentarily impacted may inflict a transit injury and if the object is non opaque œsophagoscopy may be necessary to make sure that it has passed beyond the gullet

Œsophagoscopic removal should not be attempted lightly when the foreign body has been impacted for a long time nor in those patients in whom an unsuccessful attempt has already been made and whose gullet may have been injured Such patients may require œsophagotomy

(2) *The diagnosis of dysphagia* Œsophagoscopy is nearly always indicated if dysphagia is a symptom It is particularly important in those patients in whom no abnormality is found on X ray examination

In lesions of the middle two fourths of the œsophagus the œsophagoscope usually confirms the X ray findings At either end of the gullet inspection through the instrument often corrects the X ray diagnosis which sometimes tends to be too pessimistic at the upper end and too optimistic at the lower end In the one case the powerful action of the pharyngeal muscles in the presence of cricopharyngeal spasm gives an irregular appearance which may well lead to the erroneous diagnosis of cancer and in the other a carcinoma creeping upwards from the stomach or abdominal œsophagus may be masked radiologically by an overlying spasm

In each case the correct diagnosis can usually be made by direct inspection with the œsophagoscope If a growth is seen a portion should be removed for histological examination and care should be taken in making the biopsy to obtain a piece of tissue at the edge of the lesion so that normal mucous membrane and growth can be seen in proximity when the section is prepared

(3) *The treatment of cardiospasm* In all except minor degrees of the condition which may be treated by general measures and anti spasmodic drugs dilatation by means of the hydrostatic bag introduced

through the œsophagoscope takes pride of place This method has the further advantage in that the condition can be accurately diagnosed If œsophagoscopy is omitted, patients who are suffering from œsophagitis due to regurgitation may be wrongly diagnosed as suffering from cardiospasm (see Chapter IX)

(4) *Palliative treatment of carcinoma* Those patients who are considered unsuitable for a radical operation may sometimes be considerably relieved by intubation of the growth or other endoscopic methods which are considered in greater detail in Chapter XX When the œsophagoscope is being used in this way, it is necessary to employ the large bore instrument

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CHAPTER V

ŒSOPHAGOTOMY FOR THE REMOVAL OF FOREIGN BODIES

Cervical Œsophagotomy

Nearly all foreign bodies impacted at the upper end of the œsophagus are capable of removal by endoscopy Cervical œsophagotomy is indicated in those few cases in which endoscopy has been attempted without success but with damage to the œsophageal wall and also in cases of long standing impaction Penicillin injections should be started before operation

Operative Details

Anæsthetic Endo tracheal anæsthesia is desirable

A sand bag is placed under the shoulders to extend the neck The head is turned to the right side

Incision This runs along the anterior border of the sterno-mastoid and extends from the left sterno clavicular joint to the level of the upper border of the thyroid cartilage

The anterior border of the sterno-mastoid is mobilised and retracted outwards When the incision is deepened the omo-hyoid comes into view and it is usually an advantage to divide the anterior belly of the muscle The middle and inferior thyroid veins are divided The carotid sheath is retracted outwards It may be necessary to divide the inferior thyroid artery but it is better to spare this vessel if possible The thyroid gland is retracted inwards and the œsophagus identified by blunt dissection in the interval between the trachea and the carotid sheath Identification is not always easy and if difficulty is experienced a soft rubber tube should be passed down the mouth into the œsophagus If a finger is placed in the cervical wound there should be no trouble in feeling the rubber tube as it enters the cervical œsophagus

The œsophagus is steadied with stay sutures and the surrounding parts of the wound carefully packed off with gauze soaked in 1 1 000 flavine solution The œsophagus is lifted towards the surface with

the stay sutures and a small incision made into its lumen The aspirator is held ready while this is being done so that the accumulation of infected mucus can be sucked away as soon as it is liberated The incision in the œsophageal wall is enlarged to admit a finger which is used to feel for the foreign body and to free it gently from the œsophagus Forceps are now introduced and guided into position with the finger No attempt must be made to drag the object out forcibly the manœuvre should aim at the gentle delivery of the foreign body with the least possible damage to the œsophageal wall

The whole area is cleaned carefully with small gauze mops and dusted with *penicillin powder* The mucous membrane is closed by a series of interrupted sutures of fine chromic catgut, placing and tying each stitch with care After further toilet of the wound the muscle layers of the œsophagus are brought together with a series of fine interrupted silk sutures If sepsis is present it may be an advantage to use fine sutures of tantalum or stainless steel wire The stay sutures are withdrawn and the packing removed from the wound A drain of soft latex is placed near the œsophagus, but care is taken to see that it does not rest on the suture line The drain is brought to the surface by the most direct route and the platysma and skin approximated above and below

If the œsophageal wall has been *found to be inflamed* or grossly damaged the incision into the lumen should be left open or loosely approximated Under these circumstances the wound is packed with gauze and the part of the skin incision opposite the affected portion of œsophagus left unsutured If the damage has been severe or the risk of infection great it may be necessary to carry out a gastrostomy

The dressing should consist of plenty of dry gauze and a very liberal amount of cotton wool The dressing is kept in position by a crepe bandage applied in the form of a figure-of eight to include both the head and the chest so that it may act as a splint for the first forty eight hours

After-treatment

The patient is nursed with the foot of the bed raised Penicillin injections are continued and in addition, small sips of penicillin solution are given by mouth Fluid requirements are met during the first forty eight hours by a combination of rectal and intravenous drips

Fluid is started by mouth after forty eight hours and gradually increased Solids are not given until ten days after operation

Gauze packs should be removed gradually after forty eight hours and soft latex drains left in position for five to seven days

Thoracic Œsophagotomy

It is seldom necessary to resort to œsophagotomy for the removal of foreign bodies impacted in the thoracic œsophagus but occasionally cases are encountered in which the object is so hidden by granulation tissue that endoscopic removal becomes haphazard or the nature of the object and the length of time it has been impacted may lead to the possibility of a perforation of the aorta occurring should attempts be made to move it

Under these circumstances a direct approach, with all its risks of infection may be the lesser of two evils and the use of penicillin although not in any way rendering surgical care less necessary may convert what would have been a very dangerous method into a comparatively safe one

The above considerations determined the adoption of this method by Holmes Sellors for the removal of a razor blade which was impacted in a child s œsophagus at the level of the aortic arch and by Grey Turner in the remarkable case of a woman whose dental plate had lain in her œsophagus for no less than fifteen years and which was impacted just below the root of the lung

Pre operative Preparation

If the impaction is of long standing the patient s nutrition may have suffered and it may be advisable to improve this by the use of a fortified liquid diet before proceeding further and if severe dysphagia is present it may be wise to carry out a gastrostomy as a first step The methods of improving the patient s nutrition and also the precautions which should be taken to minimise infection, are similar to those which are adopted in preparing a patient for exploration of cancer of the œsophagus These measures are fully discussed in the appropriate section (Chapter XV)

Operative Details

For the removal of a foreign body in the thoracic œsophagus the best approach is from the right side and it is an advantage to remove the greater part of a rib at the selected level The special considerations with regard to anæsthesia for these patients and the operative details associated with thoracotomy are discussed elsewhere (see Chapter XVII)

The foreign body is identified by careful palpation with the finger, and if the œsophagus seems to be adherent to the aorta in the immediate neighbourhood the two structures should be carefully separated, having first ascertained that all the instruments necessary for arterial suture are at hand This precaution is necessary because the foreign body may be on the point of penetrating the aorta and should this accident be precipitated during the extraction of the foreign body the resulting hæmorrhage may prove catastrophic whereas should it occur before the œsophagus is opened and with the aorta under direct vision it may be possible to repair the wound expeditiously Having excluded or dealt with any involvement of the aorta, the length of œsophagus containing the foreign body is packed off with care and a longitudinal incision made into the lumen The aspirator should be ready to remove infected œsophageal contents The foreign body is removed with the greatest gentleness The lumen is carefully mopped and an assessment made of the amount of damage suffered by the œsophagus After dusting the area with penicillin powder the mucous membrane is approximated with fine interrupted catgut sutures and after further mopping and the application of more penicillin powder the œsophageal muscle is drawn together with interrupted sutures of fine silk The presence of the foreign body may have resulted in the œsophageal wall becoming œdematous and friable and the meticulous care which must always be taken in suturing the œsophagus is of even greater importance than usual Here also, the use of fine metallic sutures may be an advantage

A drain is left close to but not actually touching the anastomosis and is brought out through a small independent intercostal incision at a convenient point This point is usually below the main incision and in the anterior axillary line The drainage tube is connected with a water seal drain

When closing the thoracotomy wound care is taken to see that the lung is fully expanded

If the damage to the œsophageal wall is considerable a Ryle's tube is passed for feeding purposes and if the damage is excessive a gastrostomy is carried out

After-treatment

Systemic penicillin is continued and sips of penicillin are given by mouth at hourly intervals If it has not been considered necessary to make use of an indwelling Ryle's tube or a gastrostomy fluid

requirements should be met by rectal and intravenous routes during the first forty eight hours Thereafter fluids are given sparingly by mouth and gradually increased Solids are not allowed until ten to fourteen days have elapsed

The drainage tube is removed after five days and a careful X ray control of the chest is kept both before and after this is done

Gastrotomy

This method of removal is seldom required because an object which is impacted at the lower end of the œsophagus and which cannot be extracted upwards can often be pushed downwards into the stomach In this case it may negotiate the rest of the alimentary tract without incident

In the rare event of neither of these methods proving practicable removal may be effected through an incision high up in the stomach after mobilisation of the left lobe of the liver This may be preferable in certain cases to removal by thoracotomy

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CHAPTER VI

INJURIES OF THE ŒSOPHAGUS

Injuries to the œsophagus may occur in association with

(1) The swallowing of corrosives
(2) Foreign bodies
(3) Instrumentation
(4) Damage or perforation from without
(5) Crush injuries

(1) Injuries to the Œsophagus by the Swallowing of Corrosives

The swallowing of a corrosive substance may occur accidentally with suicidal intent or occasionally it is administered deliberately with the object of killing or injuring the unfortunate recipient

In countries where "lye" is used extensively for laundry purposes corrosive injury is relatively common. Accidents may occur as the result of the dangerous practice of keeping these liquids in old beer or lemonade bottles. Would-be suicides sometimes employ corrosives for their purpose and the depression which has led to the attempt, coupled with the effects of the injury, often makes the treatment of these patients difficult

The position and nature of the damage produced by corrosives A swallowed corrosive is likely to produce its greatest effect at one or more of the three levels in the œsophagus at which a slight hold up occurs namely the post cricoid region at the level of the arch of the aorta and at the lower end

The injury produced is essentially a chemical burn and the severity of the burn depends upon the amount and concentration of the substance and the length of time it is in contact with the œsophageal epithelium This last factor varies considerably and explains those cases in which a powerful agent has produced less final damage than in others where the agent has been weaker

Portions of the epithelium of the œsophagus may be destroyed, but this destruction is seldom complete in any one plane because of the

way in which the epithelium is disposed in longitudinal folds with the result that even in the most severe injuries small islets escape damage This is an important consideration in the stage of healing when these intact islets of epithelium serve as foci from which fresh epithelium can grow From this it follows that nearly every case of stricture of this nature is amenable to treatment by dilatation

Immediate treatment Avoid the administration of emetics or the use of lavage Give the appropriate antidote and demulcent as shown in the following table

	Antidotes	*Demulcents*
Acids Mineral including Butter of antimony Soldering fluid Battery fluids	Magnesia chalk or wall plaster ½ oz stirred up in water (½ oz =14 17 gm)	Milk White of egg Thick oatmeal gruel
Acid oxalic Salt of sorrel Salt of lemon	Chalk whitening or wall plaster ½ oz in water	
Acid Carbolic Creosote Disinfectant	Careful lavage with magnesium or sodium sulphate ½ oz in 8 oz of water	Olive oil Milk
Alkalis Potash Lye Soda Ammonia Hartshorn Weed killer	Vinegar or lemon juice 1 oz diluted with water	Olive oil Milk White of egg
Cantharides —	—	Olive oil Milk

Following an injury by corrosives it is advisable to keep the patient on a liquid and semi solid diet for ten days After each feed a drink of sterile water should be taken followed by sips of penicillin solution No instrumentation should be undertaken at this stage After ten

days a normal diet can be resumed gradually. It is important to resume a normal diet as soon as it seems probable that the initial ulceration has healed because each bolus of food which is swallowed acts as a dilator.

When eight weeks have elapsed from the date of injury any stricture formation may be safely treated by dilatation.

If very severe injury has occurred as may be indicated by the immediate onset of dysphagia together with persistent pain when swallowing is attempted it is wise to carry out a temporary gastrostomy. Under these circumstances sips of penicillin solution should be given four or five times a day and constant care taken to overcome any oral sepsis which may lead to infected saliva finding its way down the gullet.

A careful watch must be kept over any patient who has suffered injury from a corrosive. Should stricture formation occur within a few weeks of the injury cautious treatment by the swallowing of a soft rubber tube is permissible in skilled hands but in general it is wiser to carry out a temporary gastrostomy in these circumstances and to defer dilatation until eight weeks have elapsed from the time of the accident. Patients who develop a stricture at a later date and those who have been tided over their difficulties by a gastrostomy may be investigated and treated in the manner described later (see Chapter VIII).

The severity of the damage which may result from the swallowing of a corrosive is illustrated by the following case history.

The patient a woman of twenty was admitted to hospital having swallowed sulphuric acid half an hour previously. Acid burns were present around her mouth and the whole buccal mucosa was coagulated and peeling off in patches as far as could be seen. There were burns of both hands and several holes in her nightdress due to splashing with the acid. Cautious gastric lavage was carried out and intravenous fluids were given. In spite of the obvious severity of the burn her general condition appeared to be good.

Soon after admission her pulse rate started to rise and she complained of tenderness across the back particularly below the angle of the right scapula. She was given fluids by the mouth but although the greater part of these appeared to go down satisfactorily she was troubled by the production of a frothy sputum and mucus. These symptoms increased and a gastrostomy was carried out fifteen days after the accident. X-ray examination at this time showed the presence of a small diverticulum in the lower third of the œsophagus.

Following the gastrostomy her general condition improved and seven weeks after the injury cautious œsophageal dilatation was started. This was not accompanied by any apparent untoward effects and twelve days

after it was started she was able to eat a soft diet without any trouble and the gastrostomy was allowed to close

Two months after the accident she was discharged from hospital eating practically all types of food and apparently making good progress She reported at the Out Patient Department a month later and although she maintained that she felt well she looked thin and ill and on examination was found to have a high temperature and signs of consolidation at the base of the right lung She was coughing up foul sputum She was readmitted and a barium swallow showed the presence of a fistula between the œsophagus and the lower lobe of the right lung The gastrostomy was re made postural drainage was started and she was given streptomycin It was hoped that with this regime she would overcome her pulmonary infection She appeared to be improving slowly but steadily until seventeen days later when she suddenly became extremely distressed at 6 a m She died shortly afterwards with pus issuing from her nose and it seemed clear that an abscess had ruptured into her bronchial tree

Post mortem examination showed a series of lung abscesses in the right lung one of which was communicating with the œsophagus at the point corresponding to the position of the diverticulum which was seen in the early X rays

Valuable lessons can be learned from the tragic story of this young girl There is no doubt that considerable damage to the lungs occurred in the early days following the accident as the result of her attempts at swallowing Some of this damage could have been avoided if a gastrostomy had been made without delay in view of the obvious severity of the burn

Dilatation of the œsophagus in the presence of a traumatic diverticulum was unwise although there is no evidence that the fistula formed until a considerably later date The patient was extremely anxious to return home as soon as she was able to swallow ordinary food but her wishes in this respect should have been resisted and if it had been found impossible to persuade her to remain in the hospital she should have been sent home with a gastrostomy Normal swallowing should have been deferred until a later date As regards the management of her final illness the question of external drainage was considered and dismissed because of her apparent improvement with postural treatment

(2) Foreign Bodies

Swallowed foreign bodies may injure the œsophagus during their passage and this is particularly liable to happen if they have sharp edges or projecting points Injuries of this nature may occur even

when the hold up has been momentary and although the patient has been able to rid the gullet of the offending object, either downwards by forceful swallowing or upwards by retching damage may have already been done Grey Turner has referred to these as 'transit injuries"

The possibility of a 'transit injury' should be suspected if there is a history of the momentary arrest of a sharp foreign body which has been shifted after short but vigorous efforts on the part of the patient The production of flecks of blood may be regarded as supporting this diagnosis unless the bleeding has been produced by the patient's fingers in a desperate attempt to reach the obstruction

In suspected cases the patient should be kept under close watch for *five to seven days* During this time the diet should be *liquid and semi solid* Every meal should be washed down with sterile water followed by a few sips of penicillin solution and penicillin should be *given systemically* *Particular attention is to be paid to the development of fullness and soreness at the root of the neck* A rise in temperature or pulse rate may be expected if the œsophageal injury has resulted *in mediastinal or cervical infection* but these danger signals may be obscured by the effect of the penicillin

Confirmation of the diagnosis may be afforded by the straight X ray and the barium swallow and, should suppuration occur the abscess must be drained (*vide infra*)

Impacted foreign bodies An impacted foreign body constitutes a condition requiring urgent treatment undue delay often resulting in ulceration or perforation *Cases have been recorded in which articles* have remained impacted for long periods without producing serious consequences but these are to be regarded as exceptions and should *on no account be used as an excuse for adopting an attitude of hopeful inactivity*

Blind instrumental removal by means of the probang is a *method* of the distant past and the remarkable fact is not that injuries often occurred but rather that it was so often possible to remove foreign bodies by this method without *ill* effect

When we read of Lees removing a farthing from the œsophagus of a child of three or of Hugh Thomas removing a halfpenny which had been *impacted in another child's* gullet for twenty eight days both of which were accomplished with the probang in 1879 we should wonder not at the crudeness of the method but rather at the *dexterity of our*

surgical forbears who were able to remove these coins without producing any ill effects in either case

Surgical literature abounds with examples of foreign bodies which have been allowed to remain impacted with fatal results Ulceration usually occurs rapidly and death follows from the perforation of some vital structure such as the aorta or from infection of the mediastinum

Remarkable cases have been recorded in which an abscess has been produced in the body of the third dorsal vertebra, and another in which erosion of the foreign body into the trachea produced a valve-like perforation which resulted in inflation of the entire intestinal tract

The ill effects usually follow close upon the accident but this is not always so and in 1910 Grey Turner reported the case of a boy of four who swallowed a halfpenny and remained perfectly well until twenty-two months later when the coin ulcerated into the aorta causing rapid death An even more remarkable record by the same author is that of a woman previously mentioned whose false teeth were successfully removed by a transthoracic approach fifteen years after their impaction

It might be thought that with the general recognition of the importance of removing foreign bodies with all possible speed and expedition together with the help afforded by radiology and skilled œsophagoscopy tragedies from impaction should now hardly ever occur Such unfortunately is not the case and although fatalities are rare by bygone standards they still take place

This happens when the impaction has never been diagnosed a mistake which may easily be understood when the patient is an infant Again the diagnosis may have been considered only to be discarded because of the apparent improvement in the symptoms Finally injury may be inflicted during attempts at removal either by the patient by forceful attempts at swallowing or by the surgeon during his instrumentation

Clumsy and unskilled instrumentation will inflict injury in a considerable proportion of cases but occasionally damage will be done even by the dextrous and skilled operator and it must be remembered that the nature of the foreign body may be such that removal is difficult without producing damage

Removal of a foreign body is usually best accomplished with the œsophagoscope (see Chapter IV) but in exceptional circumstances it is carried out with greater safety by œsophagotomy (see Chapter V)

(3) Instrumental Injuries

Prevention Even when the greatest care is exercised injuries to the œsophagus occur from time to time as a result of the passage of instruments The number of these injuries is kept as low as possible by the observance of the following rules

(i) *Accurate diagnosis* Preliminary investigations must always include a complete X ray examination of the œsophagus and thoracic contents in general This may be the only means of diagnosing certain conditions such as an aneurysm of the aorta which may be an absolute *contra indication to any form of instrumentation, or of other con*ditions which may necessitate the exercise of special care

(ii) *Blind instrumentation* This method should never be employed in the sense that an instrument is forcibly introduced into the œsophagus Failure to observe this rule has been a potent source of injury in the past Blind forcible instrumentation is not to be confused with the method in which the patient is encouraged to swallow an instrument such as a gum elastic bougie The use of a bougie in this way is a perfectly safe procedure in some cases provided that the passage of the bougie is effected by the process of swallowing The same considerations apply to the passage of the flexible gastroscope—the *surgeon should merely guide the instrument*

(iii) *Instrumentation under direct vision* The œsophagoscope is potentially a dangerous instrument It is difficult to introduce and should not be used by the impatient surgeon or by *anyone who is not* prepared to study and practise the proper procedure (see Chapter IV)

Post-cricoid pharyngo œsophageal injury The introduction of the flexible gastroscope has eliminated many of the dangers associated with the early rigid instruments which were particularly liable to injure the lower œsophagus When the flexible instrument was introduced a small number of gastric and jejunal perforations occurred These were due to the use of the Henning sponge-rubber gastroscope tip and the substitution of a blunt rubber or metal tip has removed this particular risk Fletcher and Avery Jones have drawn attention to the risk of post cricoid injuries with a flexible gastroscope and isolated examples of this type of injury were described previously by Schindler White and others

The danger of post cricoid perforation in œsophagoscopic examination has long been recognised but the majority of the perforating injuries inflicted with this instrument have been at the site of the pathological process and injury has often been caused by attempts to

intubate an inoperable growth Occasional mishaps of this nature are difficult to avoid in attempting to alleviate a most distressing condition and fall into a different category from those which occur in the post cricoid region possibly far removed from the lesion In a series of eight œsophagoscopic perforations Hoover found that two occurred in the post cricoid region Mosher reported nineteen perforations in 938 œsophagoscopies Examination with the flexible gastroscope should not be made in the presence of œsophageal disease and consequently any associated injury usually occurs in the post cricoid region Fletcher and Avery Jones reported three cases of injury in a series of 2 800 gastroscopies

Coligher regards the main predisposing factor to be the anterior prominence of the extended cervical spine particularly in the presence of cervical spurs He has drawn attention to the importance of X ray examination to exclude dangerous cervical spurs and in addition to the usual gentleness to avoid undue extension of the neck at all stages

Goligher considers that the occurrence of surgical emphysema following gastroscopy is an indication for immediate exploration He describes a case in which he did this from the left side of the neck (see Cervical Œsophagotomy) and was able to suture the perforation The patient was given intensive chemotherapy post operatively and made an uninterrupted recovery This is the first reported case of immediate suture of a perforation in this situation Surgical emphysema following œsophagoscopy presents a less clear cut indication for operation because of the strong possibility of the injury having occurred lower down in the œsophagus It may happen that the onset of symptoms is more insidious owing perhaps to the original injury being slighter than the case described by Coligher In this event the best treatment available may be to recognise the presence of infection as soon as it is evident and to treat it by prompt drainage and chemotherapy This was the method of management adopted in the following case

The patient a man aged fifty eight was admitted to hospital in May 1941 with a history of duodenal ulcer extending over several years and complicated by a perforation four years previously After this his symptoms improved for a time but recurrence of pain followed and he came to hospital with a view to undergoing surgical treatment Gastroscopy was undertaken in the course of his preliminary investigation The examination was made by an expert and was apparently carried out without any difficulty The patient made no complaint at the time of the examination but when he was questioned subsequently he said that his throat had

always been a little uncomfortable following it and attempts at swallowing were accompanied by pain Four days after gastroscopy there was some tenderness and fullness about the lower part of the neck and an accumulation of mucus in the throat The temperature rose to 101° in the evening and a diagnosis of retro pharyngeal cellulitis with possible ab cess formation was made The next day his symptoms were slightly worse and an X ray examination showed that the trachea was displaced forwards and there was a space behind the trachea showing a small collec tion of air The barium swallow confirmed this and showed some delay in passing this part of the œsophagus Chemotherapy was started the temperature fell and swallowing was improved but the tenderness and swelling remained unaltered I thought it was wise to evacuate the pus and made a transverse incision under general anæsthesia above the left clavicle dividing the sterno mastoid The incision was deepened by blunt dissection and the thyroid retracted to the right and the retro œsophageal cellular tissue opened An abscess was immediately en countered and about an ounce of foul smelling thin pus evacuated Sulphathiazole powder was introduced and a small rubber drain left *in situ* The incision was loosely sutured At the same time a gastrostomy was made to provide rest for the affected part of the œsophagus Culture showed the presence of Streptococcus viridans and diphtheroids The patient improved rapidly and nine days later the gastrostomy tube was removed Three weeks after opening the abscess I was able to carry out a partial gastrectomy from which the patient made an uninterrupted recovery Since that time the man has had no further trouble

(4) Perforation from Without

Wounds Penetrating wounds of the neck or thorax would be expected to produce examples of injury to the œsophagus Such cases are in fact seldom seen The reason for this may be that the œsophagus surrounded as it is by numerous important structures throughout its entire length is unlikely to be injured by itself and the associated injuries may cause the rapid death of the patient On the other hand stab or bullet wounds may produce an undiagnosed œso phageal injury which may cause the subsequent death of the patient by infection These cases may be tragic in that a grosser injury might have led to the carrying out of a thorough exploration of the wound with the discovery of the œsophageal injury The lesson to be learned from these considerations is the importance of conducting the explora tion in such a way that the suspected part of the œsophagus can be examined In doubtful cases X ray examination may be of help Air may be seen outside the œsophagus by this means before surgical emphysema develops and if a thin barium emulsion is swallowed it may be seen issuing from the perforation

The occurrence of surgical emphysema at the root of the neck in association with a wound which may have injured the œsophagus is a clear indication for X ray investigation and thorough exploration

Treatment In early cases the site of injury is exposed The surgical approach may be determined by the wound already present but if it appears reasonable to do so it is best to approach the cervical œsophagus from the left side of the neck and the thoracic œsophagus from the right side of the chest

The œsophageal wound is identified and the mucous membrane is sutured with fine catgut The area is now subjected to a careful surgical toilet and dusted with penicillin powder The muscular coats of the œsophagus are approximated with interrupted sutures of fine silk and the area dusted a second time with penicillin powder A drain should be left in position taking care that it does not rest on the œsophagus itself In the case of the cervical œsophagus the drain may be of latex or soft rubber tissue but where the thoracic œsophagus has been repaired drainage should be effected by an intercostal rubber tube connected with a water seal

Neglected injuries of the cervical œsophagus may give rise to a retro œsophageal abscess In this event the abscess should be drained from the left side of the neck and no attempt made to identify the perforation itself any attempt to do so would break down the protective adhesions and favour the development of mediastinitis

A neglected case of injury to the thoracic œsophagus is unlikely to survive more than a few days but in those rare instances in which a localised collection of pus forms around this part of the gullet it may be best to treat it by incision from within by means of the œsophago scope

In all cases full use must be made of penicillin and chemotherapy and it is wise to feed the patient by means of an indwelling tube for several days

Oral hygiene should receive attention and as it is impossible to prevent the swallowing of saliva the patient should be given frequent small drinks of boiled water followed by sips of penicillin solution

Pressure of drainage tubes Perforation of the œsophagus has occurred as the result of the continued pressure of a hard rubber tube used for the purpose of draining an empyema Such an occurrence must be very rare and in one recorded case the perforation closed without trouble after the offending tube had been removed

(5) Crush Injuries and Injuries by Compressed Air

Cases have occurred in which perforation of the œsophagus resulted from a crushing injury, probably due to the sudden ra of the pressure inside the lumen of the œsophagus Similar inj have also occurred as the result of accidents with compressed sometimes the consequence of a practical joke when a compresse tube has been directed into a patient s mouth Although these juries are associated with an external cause they are comparabl every other way with the condition of spontaneous rupture of œsophagus which is discussed in the following chapter

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CHAPTER VII

SPONTANEOUS RUPTURE OF THE ŒSOPHAGUS

The term implies the rupture of a previously healthy œsophagus and excludes those cases which occur at the site of some pathological process or in relation to a congenital anomaly

A classical example of the condition was recorded as long ago as 1723 when Hermann Boerhaave was called to the fatal illness of Baron De Wassenaer Grand Admiral of Holland The whole literature of the subject was reviewed and three new cases reported in a masterly paper by Barrett in 1946 in which Barrett discussed the methods of recognising the condition and laid down a plan for treatment His foresight has borne fruit and in 1947 he was able to report the first and at the time of writing the only case successfully treated by operation The reader is advised to refer to both these papers in their original

Pathology

The rupture nearly always occurs at the lower end of the œsophagus just above the diaphragm Although the tear may involve the gastric mucous membrane there is only one recorded instance of it opening into the peritoneum or peritoneal tissues

The perforation is usually situated in the left postero-lateral quadrant and may consist of what looks like a linear incision 1-8 cm in length This clean cut appearance of the lesion is modified in those patients who have survived for more than twelve hours in whom the tissues have been subjected to the results of infection and the irritant effect of gastric juices In two of the cases reported by Barrett the rupture could not be clearly demonstrated at autopsy and there is no reason why very small perforations should not set up the full train of symptoms

Rupture of the right side of the œsophagus usually occurs about 6 cm above the diaphragm Transverse tears are rare and when they occur both pleural cavities may be involved Mackenzie in 1884

carried out a series of experiments on the cadaver with the following results

(1) Raising the pressure within the œsophagus with either fluid or gas to 5–10 lb per sq in will burst the œsophagus
(2) The rupture occurs at the lower end
(3) The tear is longitudinal
(4) The mucosa offers greater resistance than the muscle coats

The factors which are thought to determine the site of rupture are the arrangement of the muscle fibres and the blood vessels the change in epithelium and the fact that at its lower end the œsophagus receives more support on the right side than on the left

Clinical Features

The accident occurs more often in men than in women and frequently follows violent vomiting which may be associated with alcoholism The part alcohol may play in the accident is two-fold in the first place it may give rise to the violent efforts of vomiting and in the second place it may *also result in inco ordinated muscular action of the* œsophagus *It seems that this second factor is a necessary accompaniment in order to produce the perforation Crush injuries may produce* this type of injury by raising the intra œsophageal pressure possibly *in association with some muscular inco-ordination*

Although overeating and drinking are common causes for the accident it may occur sometimes even in the absence of any obvious excess In nearly every case the perforation has been of sudden onset Violent pain has been experienced either in the abdomen or over the heart The pain may pass through to the renal area or to the left shoulder and this pain may persist until death supervenes The general signs are those of shock The patient may be slightly cyanosed and is usually restless and complaining of great thirst The pulse is *increased and the temperature may be subnormal in the early stages,* but may be raised later

Physical examination shows board like rigidity of the upper abdomen which may give rise to an erroneous diagnosis of perforated peptic ulcer The presence of cyanosis grunting respiration and excessive thirst may raise a doubt as to the abdominal cause of the trouble but if surgical emphysema appears at the root of the neck, this should be regarded as pathognomonic

Unfortunately surgical emphysema does not always appear in the

early stages and if there is any possibility of this accident having occurred steps should be taken to confirm the diagnosis before the appearance of this sign The chief help to an early diagnosis is X ray examination of the chest and a search should be made for any evidence of surgical emphysema in the posterior mediastinum or the root of the neck and for evidence of fluid or gas in the pleural cavity The X ray may also help by giving evidence of an intra peritoneal lesion due for example to a perforated ulcer Physical examination of the chest may suggest an early pleural effusion and aspiration should be carried out In the case of a spontaneous rupture of the œsophagus the pleural fluid usually contains blood and has the sour odour associated with the changes which it has undergone as the result of fermentation

Œsophagoscopy may be of assistance in making the diagnosis in a difficult case

Treatment

As soon as the diagnosis is confirmed a thoracotomy should be carried out and in most cases this will aim at exposing the lower end of the œsophagus from the left side The parietal pleura overlying the œsophagus should be incised and the rupture located Repair of the perforation should be carried out meticulously and it may be worth while in view of the sepsis which is associated with this type of injury to employ stainless steel wire which Belsey has shown to have certain advantages in the presence of sepsis The pleural cavity should be drained by a large rubber tube which is connected with a water seal

Full use should be made of chemotherapy and it is an advantage to introduce a Ryle s tube for feeding purposes and to give sips of boiled water by mouth followed by penicillin solution

After treatment should concentrate on getting the lung expanded

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CHAPTER VIII

SIMPLE STRICTURES OF THE ŒSOPHAGUS

Congenital Strictures

Congenital strictures are rare and may not produce any symptoms or signs until the infant starts to take solid food They contrast with cases of atresia which present as an urgent neonatal problem (see Chapter II)

Some cases of stricture which have developed gradually without any apparent cause may be the result of inflammatory changes producing contraction in a portion of the œsophagus which was congenitally narrowed Other cases of so-called congenital stricture are really examples of regurgitation from the stomach which have given rise to œsophagitis and narrowing and which ultimately may produce a short œsophagus (see Chapter IX)

It is important to make an accurate diagnosis If the stricture is congenital and has normal œsophagus below it treatment by dilatation is simple and satisfactory If œsophagitis is the underlying cause treatment may present considerable difficulty

Acquired Simple Strictures

The causes of acquired simple stricture are

(1) Cicatricial contraction following injury by a corrosive
(2) Contraction following damage by an impacted foreign body or following damage produced by attempts at its removal
(3) Contraction resulting from the healing of reflux œsophagitis
(4) Certain rare causes which are of importance only from the point of view of differential diagnosis (see Chapter XXII)

Groups (1) and (2) can usually be treated by dilatation following the method described below Group (3) may present more difficulty in management and the appropriate treatment is considered in Chapter IX

The Management of Simple Strictures resulting from Corrosives

The gradual onset of dysphagia occurring after an injury by a corrosive usually indicates the formation of an organic stricture but it must be remembered that in some cases the accident has been associated with a severe emotional disturbance, which in itself upsets the neuro muscular co ordination upon which swallowing depends

Investigation A general examination will show evidence of wasting and the present weight of the patient should be compared with that which obtained before the accident Search should be made for any evidence of malignant disease and the investigations should include blood counts and hæmoglobin estimates and examinations of the stool for occult blood

X ray studies using barium emulsions of increasing consistency, will demonstrate the position and extent of the stricture Confirmation of its nature is obtained by œsophagoscopic examination

The sudden onset of complete dysphagia may have been occasioned by the impaction of a solid object such as a cherry stone at the site of the stricture The presence of such an object will be revealed at œsophagoscopy and its removal must precede any further treatment If the dysphagia is complete it may be necessary to carry out a preliminary gastrostomy before undertaking treatment of the stricture itself However if liquids can still be swallowed it is better to avoid resorting to this operation and to give instead a fortified liquid diet rich in vitamins and at the same time to remove all solid food from the diet

Self dilatation with gum elastic bougies This should be regarded as the treatment of choice The method is free from danger, provided that no force is used in the introduction of the bougies and the nature of the lesion has been correctly diagnosed

Patients who have been treated unsuccessfully by œsophagoscopic dilatation are not always willing to embark on what appears to them to be a similar method of treatment Self dilatation differs in that it can be carried out frequently and the passage of the bougie is aided by the swallowing mechanism of the patient whereas the œsophagoscopic method usually entails an anæsthetic which limits the frequency of dilatation and the introduction of the instrument even without an anæsthetic effectually prevents any normal movement of the œsophagus These differences should be fully explained to any patient who is sceptical of the benefits likely to be obtained

Introducing the bougies The full co-operation of the patient is

essential A tablet of Decicaine sucked half an hour before the carrying out of the dilatation is a help in some cases but should not be given unless it is found to be necessary The patient is seated and instructed to breathe deeply several times A bougie is now selected from the smaller sizes and well lubricated with olive oil after standing it in a jug of warm water to make it pliant The bougie is introduced gently into the mouth keeping strictly to the mid line As soon as the bougie is felt in the pharynx gentle swallowing is started keeping the lips lightly closed and breathing through the nose The passage of the bougie is encouraged but anything in the nature of forceful pushing must be avoided It is often wise not to try to introduce a large bougie at the first session but to concentrate on gaining the patient's confidence Later the size may be increased gradually and the patient may be allowed to manage the procedure independently

In the early stages dilatation should be carried out two to four times daily but the interval can be gradually lengthened The swallowing of solid food should be encouraged as soon as it can be effected with comfort because each bolus of food in itself acts as a dilator Treatment should be continued for many months and even when swallowing is quite normal the bougie should be passed once or twice a year to make sure that there is no recurrence

The Management of Long standing Strictures

Strictures which have been present for many years and those which were caused by severe initial damage may not readily yield to the comparatively simple procedure already described In such cases the following method may prove useful

After complete investigation the patient is encouraged to swallow a ureteric catheter This may be difficult and may take several hours to accomplish but it is rarely impossible A general anaesthetic is now administered and a Kader Senn gastrostomy carried out at the same time recovering the lower end of the ureteric catheter from the stomach and bringing it out through the gastrostomy tube A long piece of rubber tubing is now attached to the stomach end of the ureteric catheter which is withdrawn upwards leaving the ends of the rubber tubing projecting through the mouth above and through the gastrostomy below

Dilatation is carried out by attaching a suitable gum elastic bougie to the rubber tube and insinuating it through the stricture by a combination of gentle pressure on the bougie and gentle traction on the

rubber tube The bougie may be attached to either end of the rubber tube and it may be easier to effect the first dilatation from below upwards (Fig 33)

Dilatation is necessarily slow and should be carried out daily The size of the bougie must be increased cautiously and after each dilatation the bougie is withdrawn leaving the rubber tube in position for

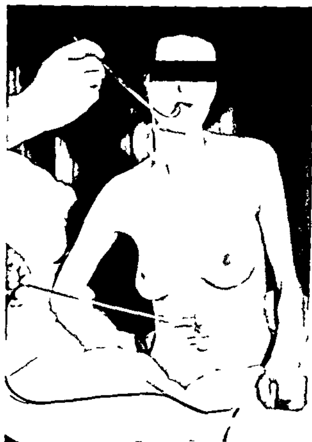


Fig 33 — Guided dilatation

the next attempt When a moderate-sized bougie can be swallowed with certainty and without having to rely on the assistance of the rubber tube this can be removed the gastrostomy allowed to close and self dilatation continued as described before However quickly the stricture responds to dilatation by this method it is necessary to retain the gastrostomy tube for ten days on account of the risk of leakage occurring should it be removed prematurely

Other Methods of Dilatation

Periodical dilatation through the œsophagoscope has already been mentioned and the disadvantages of the method have been enumerated The use of a swallowed thread devised by Vinson has many advocates The patient swallows a small soluble pastille to which is attached the end of a thread several yards long The patient drinks freely with the object of encouraging the thread to find its way through the stricture When the end of the thread has reached the small intestine the proximal part is drawn taut while the distal part of the thread remains firmly anchored in the coils of small bowel Graduated bougies with an eye at the tip are now threaded on to the proximal part which is kept taut and which acts as a guide through the stricture while the bougie is being gently introduced

In the author s hands this method has often proved disappointing the thread remaining coiled up in the œsophagus above the stricture

Another procedure which has been devised for the treatment of difficult cases consists in the passage of graduated tapering beads which are strung on to a thread It is first necessary to make a gastrostomy in order to recover the end of the thread from the stomach Sufficient thread is drawn through so as to have plenty in hand and the graduated beads are then attached at intervals By withdrawing the thread upwards through the œsophagus the stricture is dilated in a retrograde manner by the series of graduated beads

These methods of dilatation do not in the author s opinion possess any advantages over the procedures which have been recommended

Operative Treatment of Cicatricial Strictures

Operative treatment appears to present a very attractive alternative to the tedious methods of dilatation which have been described above Operation however may be followed by a number of ill effects which render the procedure unsuitable except in special circumstances Various operations have been employed

(1) *The construction of an ante thoracic tube composed of skin or a combination of skin bowel and stomach* Yudin in particular has used this method with great success The widespread use of lye in Russia appears to have been productive of a great number of corrosive injuries Many of these operations have been designed with great ingenuity and carried out brilliantly They all suffer from the disadvantages of being liable to leave fistulæ which may necessitate many operations

before they are finally healed Even when this is achieved the patient is left with what is at best, a very poor makeshift for the normal gullet

(2) *Excision of the stricture and restoration of continuity by bringing up the stomach and carrying out an œsophago-gastrostomy* This operation destroys the sphincteric mechanism at the lower end of the œsophagus As a result of this there is a great tendency for the patient to develop reflux œsophagitis which in turn may lead to the formation of another stricture This is a risk which it is justifiable to take in cases of malignant disease where the original lesion is a lethal one Moreover cancer usually occurs in elderly patients who have not a great many years before them in any event Whereas the young patient who has a stricture excised may have many years in which to develop severe complications due to regurgitation from the stomach

(3) *Excision of the stricture and restoration of continuity by an anastomosis of small bowel to the œsophagus* This method is less likely to produce œsophagitis but it is a very severe procedure for the cure of a condition which can usually be treated satisfactorily by dilatation

(4) *Excision of the stricture followed by œsophago-œsophagostomy* This is only applicable in the case of a stricture of very limited extent and this type of stricture is usually amenable to dilatation

In spite of the disadvantages associated with radical operation certain patients are encountered for whom it is the method of choice

(1) In certain cases of stricture complicated by a fistula communicating with the air passages This complication may occur in association with the original injury and is sometimes seen after severe corrosive damage *or following the impaction of a foreign body*

A fistula may be produced as the result of damage inflicted during œsophagoscopic manipulation An extremely rare cause is tertiary *syphilitic disease of the œsophagus*

If a gastrostomy is carried out the fistula may heal spontaneously and treatment by dilatation can then be proceeded with

This is illustrated by the case of a young Arab soldier who accidentally swallowed fuming nitric acid He sustained a severe burn of the œsophagus and a gastro tomy was advised He refused this advice and was treated with penicillin and intravenous therapy A severe stricture developed which extended from the level of the left bronchus almost to the cardia The resultant dysphagia gradually increased and six months after the accident dilatation through the œsophagoscope was carried out At first this treatment was successful and he started to gain weight but on several occasions great difficulty was encountered during the procedure

with the result that he developed mediastinitis The attacks of mediastinitis were treated with penicillin

At the last œsophagoscopic dilatation the œsophagus was found to be grossly scarred and constricted at the level of the left bronchus and the introduction of a fine bougie gave the impression that a number of false passages were present Any attempt at swallowing produced violent coughing

At this point the patient was referred to the author

The man was emaciated and even a small sip of water produced a violent paroxysm of coughing Gastrostomy was carried out as an urgent measure and no further investigations were made until his condition had improved A few days later he was examined radiologically The X ray appearance of the lungs gave rise to the suspicion that pulmonary tuberculosis might be present but it was considered that this appearance might have been produced as the result of the aspiration of food The subsequent recovery of tubercle bacilli in the sputum however proved that the original suspicion of tuberculosis was well founded The introduction of iodised oil into the upper part of the œsophagus showed the presence of a large fistula into the bronchial tree (Fig 34)

The patient was given a ureteric catheter and instructed to swallow it He was not very enthusiastic at first and considerable persuasion was necessary in order to gain his co operation After some hours the catheter found its way down the strictured gullet and the end was recovered through the gastrostomy opening Guided dilatation was carried out on the lines already described (p 71) and continued until a bougie could be passed with comparative ease As soon as this stage had been reached the gastrostomy was allowed to close and auto-dilatation was proceeded with in the usual way With the gradual improvement in swallowing the patient s enthusiasm in the bougies became unbounded and he needed no encouragement to persist in the treatment Within a few weeks he was eating normally and putting on weight fast A subsequent barium swallow did not show any evidence of an œsophago-tracheal fistula (Fig 35)

It is not always possible to achieve such a happy result by this simple method and if following a gastrostomy and bouginage the fistula does not heal operation may be indicated

Careful preparation is essential Attention is given to the lungs in the form of postural drainage breathing exercises and the administration of antibiotics If bronchial secretion is very excessive it may be necessary to make a temporary tracheotomy through which the secretions can be aspirated

When the patient s condition has improved the position and size of the fistula is determined as accurately as possible For this purpose X ray studies are made with lipiodol introduced into the trachea or œsophagus and direct inspection is carried out by endoscopy Several weeks should elapse before the exploration is undertaken Not only

will the nutrition and pulmonary condition improve during this time but the local rest which has been provided will result in a considerable lessening of the inflammation around the fistula



Fig 34 —Lipiodol introduced into the upper part of the œsophagus shows an extensive stricture of the œsophagus together with a fistula into the trachea

Operative procedure If a tracheotomy is present the anaesthetic is administered by this route and aspiration of the trachea is carried out at frequent intervals throughout the operation

The presence of a fistula indicates that the lesion is at least as high

as the root of the lung and any anastomosis which is made will have to lie above the arch of the aorta When making an anastomosis at this

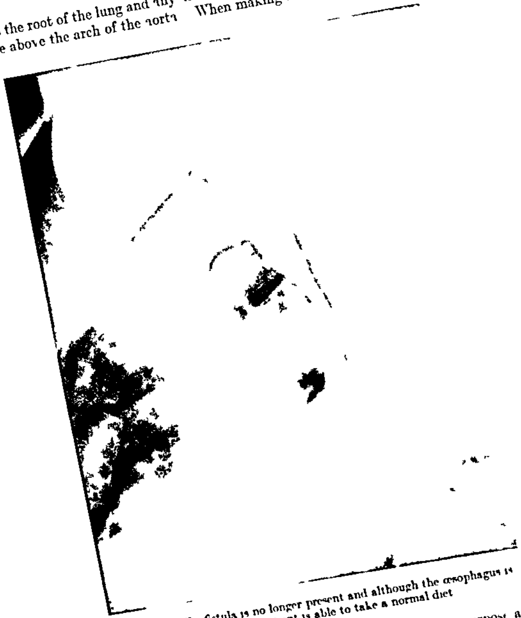


Fig 35 —The fistula is no longer present and although the oesophagus is narrowed the patient is able to take a normal diet

high level it is an advantage to use the stomach for the purpose and this on the whole is best accomplished by a left sided approach The

ideal procedure is to excise the œsophagus from a point above the fistula down to the cardia repair the hole in the trachea or bronchus and restore continuity by anastomosing the fundus of the stomach to the upper cut end of the œsophagus For closing the hole in the trachea or bronchus interrupted sutures of stainless steel or tantalum are to be recommended

Mobilisation of the stomach and anastomosing it with the œsophagus are carried out in the same way as in the case of resection for carcinoma and are described in detail in Chapter XVII

(II) When the patient is temperamentally unsuited for treatment by dilatation Some patients cannot face the prospect of a long and tedious period of disability and would rather take the risk of a major operation If the stricture is situated near the lower end of the œsophagus, the affected portion of the gullet may be excised down to the cardia and continuity restored by bringing up a loop of small bowel and anastomosing it to the œsophagus If the anastomosis is too high for a loop to be used Roux s method should be employed In either case the restoration of continuity is effected in a way similar to that which is used to complete the operation of total gastrectomy (see Chapter XVIII)

In the circumstances under discussion it is not necessary to resect the stomach unless the stricture is associated with reflux œsophagitis If the stricture is very limited and is favourably placed it may be possible to excise the affected portion and anastomose the two cut ends In exceptional cases it may even be possible to carry out a plastic procedure incising the œsophagus longitudinally and sewing it up transversely

(III) In the case of strictures associated with reflux œsophagitis and thoracic stomach (See Chapter IX)

(IV) When the nature of the stricture cannot be determined by investigation From time to time patients are met with who are suffering from œsophageal obstruction the nature of which is in doubt even after the most careful investigations have been made In such cases an exploration must be carried out and if the pathology proves to be that of a simple stricture its operative relief should be proceeded with on the lines discussed above

CHAPTER IX

REFLUX ŒSOPHAGITIS, PEPTIC ULCER OF THE ŒSOPHAGUS HIATAL HERNIA, SHORT ŒSOPHAGUS

Inflammation of the œsophagus may occur from a variety of causes The œsophagitis which may accompany the specific fevers fungus infections tuberculosis syphilis and new growths is comparatively unimportant either because of its rarity or because the seriousness of the underlying cause overshadows the effects of the associated inflammatory changes

Œsophagitis due to the regurgitation of gastric juices presents a problem of far greater importance It is only recently that a clearer understanding has been obtained of the relationship between this type of œsophagitis and the condition of short œsophagus hiatal hernia and chronic peptic ulceration of the œsophagus All these have been recognised and described for many years without any clear conception of the underlying pathology and the contributions of Allison and Barrett deserve particular mention for the light they have thrown on to this difficult problem Much awaits solution and as in so many problems of this nature the clearing up of one difficulty seems to disclose others of even greater complexity

Much of the confusion in the past has been the result of faulty nomenclature The most satisfactory name for the condition under consideration is that suggested by Barrett reflux œsophagitis

Reflux œsophagitis starts in the lower part of the œsophagus and is caused by the irritation of the gastric juices

The term peptic ulceration has been applied to this condition but it is open to the objection that it may suggest ulceration occurring in ectopic islets of gastric mucosa which are found on occasions at any level of the œsophagus

Many examples have been recorded of chronic eroding ulcers at all levels of the thoracic part of the alimentary canal and because histological examination has shown the presence of gastric mucosa

it has been assumed that the ulceration has arisen in the ectopic islets.

Ectopic islets of gastric mucosa occur without question but it seems

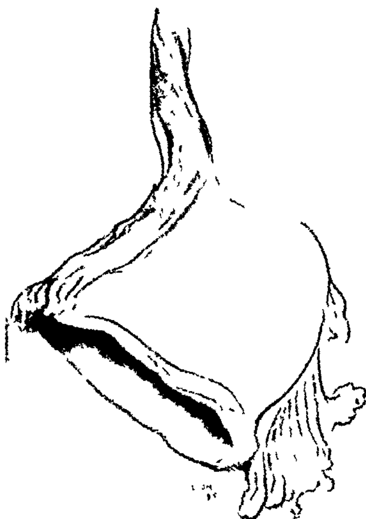


Fig 36.—Thoracic stomach and lower end of œsophagus removed at operation. Subsequent histological examination showed the whole specimen to be lined with gastric mucosa.

probable from Barrett's observations that ulceration seldom if ever occurs in them. On the contrary, even when an eroding ulcer occurs at the level of the arch of the aorta the so-called ectopic islet of gastric

mucosa may extend as an unbroken sheet right down into the abdominal part of the stomach

In other words what has so often been regarded in the past as œsophagus may in reality be stomach which has been drawn upwards into the chest (Fig 36) The truth of this statement has been shown by Allison who has marked with clips applied through the œsophago scope the level at which the œsophageal epithelium gives place to the gastric mucosa and then examined the patient radiologically

If the truth of this conception is accepted it becomes clear that the thoracic portion of the alimentary canal is commonly affected by two types of simple ulceration First a superficial and often intermittent ulceration due to reflux œsophagitis and secondly a chronic eroding peptic ulcer situated in what is in fact a thoracic portion of the stomach

Reflux Œsophagitis

Normal individuals occasionally regurgitate gastric contents into the œsophagus and may suffer from temporary upsets from time to time which result in attacks of vomiting No harm results from these particularly if the gastric contents are non irritating On the other hand if regurgitation is continued over a long period or if vomiting is excessive the condition of reflux œsophagitis is likely to result and the severity of the inflammation depends upon the nature of the regurgitated material

Causes of Reflux Œsophagitis

The underlying causes of reflux œsophagitis may be considered under the following headings

Excessive Vomiting

This may occur in association with pregnancy after operations and in connection with certain intracranial conditions Excessive vomiting of pregnancy is a potent cause of reflux œsophagitis

Failure of the Cardiac Sphincter

In the normal subject regurgitation from the stomach is controlled by the lower œsophageal or cardiac sphincter The nature of this sphincter is complex and its precise mode of action uncertain Studies of this region show that there are probably three factors which con tribute to the sphincteric effect the circular muscle at the lower end of the gullet the fibres of the right crus of the diaphragm and the

nature of the insertion of the œsophagus into the stomach (see Chapter I)

The normal functioning of the cardiac sphincter is interfered with in the following circumstances

(1) IN THE PRESENCE OF A HIATAL HERNIA A hiatal hernia will weaken the sphincter and so favour regurgitation if the acute angle of insertion of the œsophagus is increased, or if the œsophago-gastric junction is displaced above the opening in the diaphragm

The second variety constitutes a 'short œsophagus' (Fig 37) In the past it has been customary to regard the primary defect as a congenital short œsophagus resulting in a hiatal hernia and regurgitation Although this view may be correct in some cases it does not provide an adequate explanation for the comparatively large number of herniæ of this type which are seen in middle-aged and elderly patients It seems much more probable that the shortening of the œsophagus is a secondary phenomenon caused by the œsophagitis

It is well established that in infants and in the elderly there is considerable laxity of the œsophageal hiatus producing what may be regarded as intermittent herniation In the infant this state of affairs does not usually cause trouble because the material regurgitated from the stomach is non irritating in nature and does not produce œsophagitis unless malnutrition or other factors are present With the increase in muscular activity which normally accompanies healthy adult life the tendency to intermittent herniation disappears and consequently œsophagitis is uncommon

With the passage of the years the picture changes once more sedentary habits and fatigue are only too often accepted as the necessary accompaniment of middle-age, and the fit and muscular subject of forty five may slide imperceptibly into the flabby overweight one of fifty

These external signs of deterioration are often associated with a corresponding weakness in the structures surrounding the cardia and the condition of intermittent herniation occurs yet again On this occasion however the subject of the hiatal hernia is no longer the infant with his bland diet and blameless life Instead we have to deal with a patient who may have developed an ulcer diathesis or be incapable of proper mastication because of bad teeth or ill fitting dentures and who in any event will probably be more prone to flatulence and raised abdominal pressure

All these considerations increase the tendency to regurgitation or make the results of regurgitation more harmful

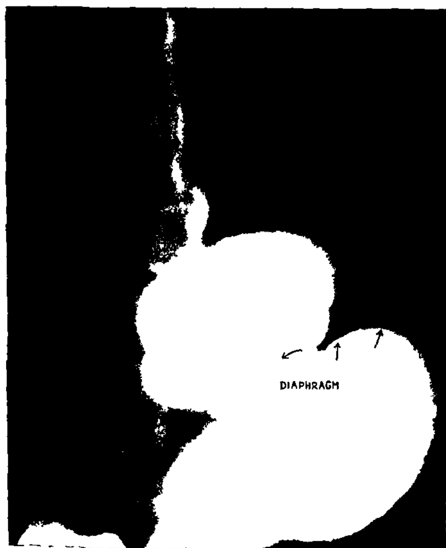


FIG 37 —Hiatal hernia in a woman of sixty

She presented with symptoms of reflux œsophagitis. All her symptoms disappeared after she had followed a careful medical regime

(2) DURING ILLNESSES WHICH WEAKEN THE MUSCULAR TONE OF THE PATIENT Any severe illness which weakens the patient may cause a

temporary upset in the lower sphincter of the œsophagus The effect of this temporary weakening of the sphincter is increased if the patient has to be kept supine, or worse still in the Trendelenburg position for a long time as for example may occur if post operative resuscitation is protracted Abdominal distension and flatulence encourage regurgitation still further

(3) In association with duodenal ulceration Patients suffering from a duodenal ulcer frequently complain of heartburn which indicates a regurgitation of irritating gastric contents into the œsophagus Whether regurgitation is more common in these patients than in normal people or whether the occurrence of regurgitation is merely more obvious is a matter of doubt However there is some evidence to suggest that spasm of the pylorus and increased gastric secretion may favour regurgitation

(4) Following certain operations

Partial œsophagectomy with restoration of continuity by means of gastric anastomosis This operation has become the usual procedure in certain cases of resectable cancer of the œsophagus

It results in the complete destruction of the cardiac sphincter and exposes the remaining part of the œsophagus to irritation The technical advantages of this method are however, considerable and if the patient is an elderly subject suffering from an otherwise fatal condition the risk of œsophagitis must be accepted and measures taken to prevent or diminish it

The same view cannot be taken in the case of a young patient suffering from a simple condition Here the expectation of life is longer and the gastric secretions more active and the risk of developing œsophagitis greater Moreover, although the cancer patient who has been fortunate enough to survive the resection will be willing to accept the measures necessary to combat œsophagitis, the sufferer from a less serious complaint may not be satisfied to exchange the original trouble for a different but equally annoying one

Operation for cardiospasm Œsophago-gastrostomy and cardioplasty destroy the normal function of the sphincter and both these operations are likely to be followed by reflux œsophagitis

Operations for the repair of diaphragmatic hernia If operation has to be undertaken an effort must always be made to restore the anatomical arrangement at the cardia as accurately as possible In

many cases of hiatal hernia the symptoms of which the patient complains are due to the resultant œsophagitis and it may not be necessary or possible to correct the hernia itself

Pathological Changes in Œsophagitis

Superficial ulceration occurs which is very similar to that which is found in the early stages of duodenal ulceration and the conditions may be regarded as strictly comparable In many cases the two conditions are present in the same patient and heartburn which is usually regarded as a manifestation of duodenal trouble is in fact probably produced by the concomitant œsophagitis

The ulcers are small superficial and multiple and always start at the lower end of the gullet Seen through the œsophagoscope the epithelium is reddened and shows superficial abrasions which bleed readily when touched with the instrument As with its counterpart in the duodenum the condition shows a tendency to heal and break down again

The effect on the muscular coats of the œsophagus is the production of spasm followed later by cicatricial contraction Contraction of the longitudinal fibres produces shortening of the œsophagus drawing the œsophago gastric junction upwards and still further diminishing the effectiveness of the lower œsophageal sphincter A vicious circle is now established further ulceration leads to more shortening which in turn encourages more regurgitation and so the process continues The action of the circular muscle tends to limit this in that first by spasm and later by cicatricial contraction the inroads of the gastric contents are resisted This barrier however is set up at the cost of stricture formation (Fig 38)

Symptoms

These are pain dysphagia and symptoms due to bleeding All these symptoms may be present together or they may occur separately The severity of the symptoms varies from a very slight disturbance to a major illness

Pain This is a common symptom The patient may complain of heartburn which is sometimes severe The situation of the pain is retrosternal and may radiate through to the back between the shoulder blades or up into the neck and down one or both arms All degrees of pain are met with usually it is of slight to moderate severity but occasionally the pain is such as to suggest the possibility of some

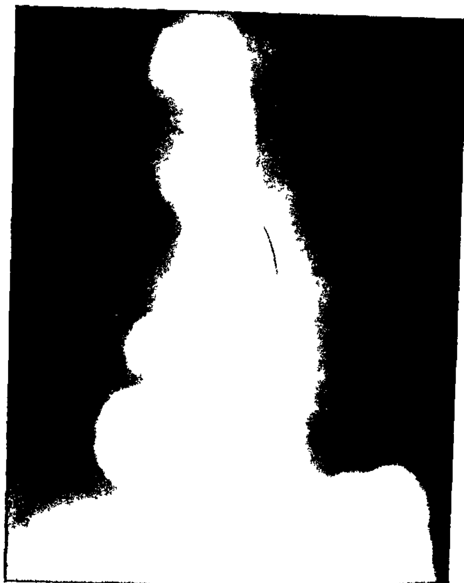


FIG 38 —Hiatal hernia producing œsophagitis with stricture formation
A partial gastrectomy was carried out by the abdominal route and the symptoms were relieved.

grave emergency. The precipitating factors are characteristic—pain often follows soon after eating and the nature of the food seems to make a difference; hard, hot or highly spiced foods are especially liable to be followed by pain. Pain is also produced by any circumstance which encourages regurgitation, bending or stooping, by raising the

intra-abdominal pressure will bring on the pain, as will the assumption of the recumbent position.

The patient can usually point out the site of the pain with some accuracy.

Dysphagia. In the early stages this is due to associated spasm and consists of the subjective feeling of food being held up in the gullet. At this stage regurgitation does not often occur. Later on, if the condition progresses, cicatricial contraction occurs with the formation of a stricture which leads to increasing dysphagia with regurgitation. Even in these advanced cases, however, there is often an element of spasm.

Bleeding. The hæmorrhage is usually insidious, the patient often noticing tiredness in addition to some of the symptoms already enumerated. Investigation may disclose anæmia and a further search may reveal the fact that bleeding is occurring from the lower end of the gullet. In rare cases hæmorrhage may be sudden and violent and lead to the erroneous diagnosis of gastric or duodenal bleeding.

Diagnosis

The history and X-ray examination may suggest the diagnosis, but confirmation depends upon œsophagoscopy. The appearance of superficial ulcers at the lower end of the gullet accompanied by the free regurgitation of fluid from the stomach during the course of the examination is diagnostic of œsophagitis provided that the presence of certain other lesions can be excluded with certainty. The most important of these is carcinoma arising in either the lower end of the œsophagus or at the cardiac end of the stomach. In either situation a cancer may produce a disturbance in the action of the lower œsophageal sphincter. Apart from a careful inspection on the first occasion it is most important to follow the course of a patient suffering from reflux œsophagitis with the greatest possible care, taking note of the clinical progress, the X-ray appearance and the results of œsophagoscopic examination. In some cases the diagnosis may still be in doubt and it will be necessary to explore the lower end of the œsophagus. True cardiospasm or achalasia may present difficulties in diagnosis and many patients suffering from a temporary spasm associated with œsophagitis have been wrongly diagnosed as suffering from the former condition. This mistake is of great importance because the treatment of the two conditions is opposed. There are several differences which should serve to distinguish them. In the first place the characte

X ray appearance of cardiospasm shows an absence of the gastric air bubble The most important points of differential diagnosis are seen with the œsophagoscope In cardiospasm the whole œsophagus is



Fig 39 —Hiatal hernia with a chronic gastric ulcer in the thoracic portion of the stomach

dilated to a greater or lesser degree and may be filled with food debris and fluid but when once the gullet has been emptied by suction further regurgitation is slight and does not present any difficulty to the further

conduct of the examination If the patient is suffering from œsophagitis on the other hand the œsophageal content may be quite small but regurgitation from the stomach is frequent and the constant appearance of fluid at the lower end of the gullet may make examination difficult

Another important difference is the ulceration Characteristically this does not appear in patients suffering from cardiospasm but in some long standing cases a type of ulceration occurs which is comparable with the stercoral ulcers which may be found in the large bowel in chronic obstruction The ulcers in such cases are scattered throughout the length of the œsophagus and are separated from one another by areas of normal epithelium The picture seen in œsophagitis is quite different the lowest part of the gullet is always most affected It presents a generalised reddened appearance and bleeds easily and at various places shallow ulcers are seen which give the impression of being superficial abrasions

True peptic ulcers are occasionally seen through the œsophagoscope and must be distinguished from œsophagitis The first type of ulcer is an ordinary gastric ulcer which happens to be situated in a part of the stomach which is lying within the thoracic cavity The fact that a portion of the stomach is intra thoracic almost certainly suggests the association of œsophagitis but the presence of the true peptic ulcer below may necessitate a revision of the treatment (Fig 39)

Treatment

The treatment of reflux œsophagitis is comparable to that of its counterpart in the duodenum Sources of anxiety and irregularity of habits should be attended to The condition of the mouth and teeth is important Not only should oral sepsis receive treatment but what is probably even more important steps must be taken to see that the patient has sufficient teeth or well fitting dentures to ensure the proper mastication of food

The meals should be frequent small and light Very hot coarse and highly spiced articles of diet must be avoided and after each meal the patient should take alkaline powder It is an advantage to give these powders without water so that the dry powder tends to cling to the surface of the œsophagus If the symptoms are severe or have been accompanied by hæmorrhage or if there is an associated duodenal ulcer treatment should start with four weeks in bed Olive oil in doses of 1 4 c c should be given after the last meal The patient is

instructed to avoid stooping or bending and is advised to sleep with the shoulders well raised on pillows If this regime is carried out conscientiously, most patients will obtain relief and will remain free from serious trouble If this proves to be the case no treatment is necessary for the hiatal hernia which may be present unless other complications occur (Fig 37)

Operative Treament

Medical treatment alone will not suffice if stricture formation has occurred if there have been repeated hæmorrhages or if conscientious trial has shown it to be ineffective

Stricture Formation Cautious dilatation of a stricture may be carried out provided that the patient is kept on an ulcer regime and given alkaline powders If this precaution is omitted the only result of the dilatation may be that further reaches of the œsophagus are opened up with the formation of a stricture at a higher level The same result is liable to follow ill advised attempts to cure the condition by partial œsophagectomy and œsophago gastric anastomosis

In some cases the treatment of a stricture by dilatation is unsatisfactory and recourse must be made to more radical measures

Radical Measures for the Cure of Œsophagitis

Radical measures are called for in a small residue of patients only The indications for radical measures are repeated severe hæmorrhage failure of medical regime inability to check stricture formation or the presence of an eroding ulcer in a thoracic stomach

In the present state of our knowledge the most satisfactory operations are

(1) *Partial gastrectomy* This is suitable in those cases of œsophagitis in which a cone of stomach has been drawn up above the diaphragm but in which there is no evidence of the development of an eroding ulcer An early stricture is no contra indication to the operation which often produces very great improvement in swallowing even without the subsequent use of bougies

The aim of the operation is to diminish the gastric secretions without producing any further impairment of the cardiac sphincter

The operation which is carried out *by the abdominal route consists* of a reasonably high Billroth I partial gastrectomy The diaphragm is not *interfered with in any way (Figs 10a and 11)*

(2) *Total gastrectomy* (Fig 40b) This is the only procedure which is likely to give relief when the intra thoracic portion of the stomach has become the seat of a chronic ulcer The operation is carried out

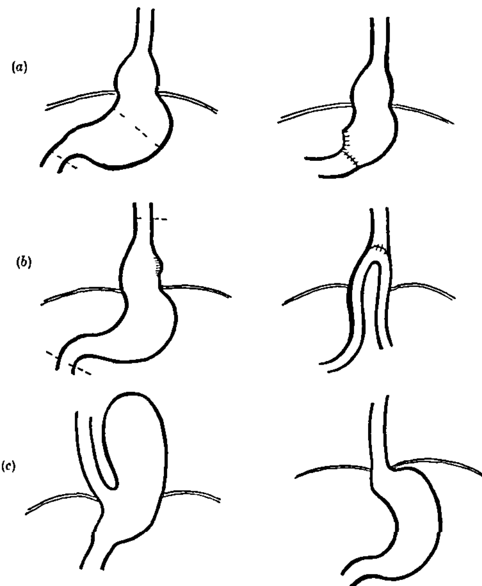


Fig 40—(a) Partial gastrectomy below the diaphragm
(b) Total gastrectomy by the abdomino-thoracic route
(c) Improvement of the anatomical arrangement

through the left sided abdomino-thoracic approach and continuity is restored either by means of a loop of small bowel, or if necessary by Roux s Anastomosis en Y The operation is one of some magnitude and has the disadvantage that the sphincteric mechanism at the cardia



FIG 41 — X ray showing a hiatal hernia in a woman of sixty seven

Her symptoms which had lasted [illegible] two years consisted of epigastric pain and the frequent regurgitation of food. The changes characteristic of reflux oesophagitis were seen in the lower third of the gullet. Her symptoms were completely relieved by a [illegible] partial gastrectomy

is destroyed completely This last consideration is not of great importance in most cases because the removal of the stomach effectively prevents irritating juices from reaching the oesophagus

In one of the author s patients however a brisk œsophagitis occurred

even after total gastrectomy suggesting that in certain instances the regurgitation of juices from the small bowel may be sufficient to perpetuate the trouble In this case there were other complicating features the patient had a positive Wassermann reaction and in addition had such a strong aversion to any form of diet which was suggested that it was difficult to maintain proper nutrition After several months the condition cleared up spontaneously

(3) *Improvement of the anatomical arrangement at the œsophageal hiatus of the diaphragm* (Fig 40c) This method finds most application in the presence of a para œsophageal hernia and when the œsophagus is either normal in length or only slightly shortened

The extent of the gastric herniation does not determine the suitability of this type of operation and in any event the degree of herniation is often found to vary considerably if the radiological examination is repeated The operation is not suitable if a gastric ulcer is present

The most satisfactory exposure is obtained through a left sided thoracotomy incision A radial incision is made in the diaphragm just in front of the œsophageal hiatus A finger is then introduced through this incision and hooked up into the hernial sac The diaphragmatic incision is now enlarged so as to open up the whole of the sac and enable a careful examination to be made of the stomach and lower part of the œsophagus

The diaphragm is paralysed by crushing the phrenic nerve After removing the sac and returning the stomach to the abdomen the œsophageal hiatus is reduced in size and the diaphragm is carefully sutured to the œsophagus Before repairing the defect in the diaphragm it may be possible to stitch the fundus of the stomach to the lower end of the gullet in such a way as to restore or maintain the acute angle at the gastro-œsophageal junction

If a large part of the stomach has been lying within the thorax it may be found that the lower part of the œsophagus is displaced forwards In such cases no attempt should be made to restore the normal anatomy Instead the diaphragm should be closed completely behind the œsophagus which is then left in the anteriorly displaced position to which it has become accustomed

(4) *Partial œsophagectomy and excision of the proximal part of the stomach with restoration of continuity by œsophago-gastrostomy* This operation is indicated in elderly patients with an extensive œsophageal stricture The objection to the operation is that further œsophagitis

may result but provided that measures are taken to combat this possibility the procedure is justified in this type of patient and has the advantage of being relatively simple. The operation is carried out in the same manner as for a carcinoma in the lower part of the œsophagus which is not involving the stomach (see Chapter XVII).

Œsophagitis in Infants and Small Children

Infants occasionally show signs of dysphagia a few days or weeks after birth. These infants are not to be confused with those suffering

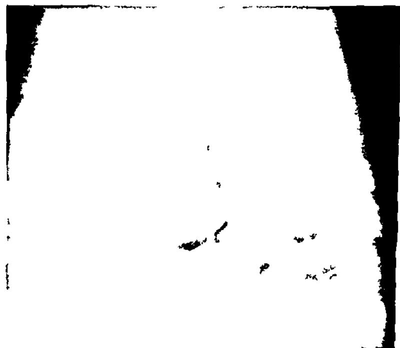


FIG. 42.— Short œsophagus in an infant of eighteen months. Dysphagia had been present from the time he started to take solid food.

from congenital atresia of the œsophagus who have a deformity which untreated is incompatible with life (see Chapter II).

The type of dysphagia under consideration shows itself as an increasing difficulty in feeding which may not assume serious proportions until the child starts to take solid food.

Occasionally, however, the difficulty is considerable even in the first few weeks of life and owing to the similarity between regurgita

tion and vomiting in young infants an erroneous diagnosis of congenital pyloric stenosis is sometimes made

X ray examination usually shows either a narrowing near the lower end of the œsophagus or a hiatal hernia with a short œsophagus and the appearance of a stricture at the junction of œsophagus and stomach



FIG 43.—Treatment with bougies has been followed by complete freedom of symptoms

A stricture can still be seen where the shortened œsophagus joins the cone of stomach in the thorax

The explanation usually given is that in the first type the infant is suffering from a congenital narrowing of the œsophagus and that in the second type the primary lesion is a congenital short œsophagus

This view of the underlying cause is probably true in some cases but in many others and possibly in the majority the stricture is an acquired one even in these very young patients Facts which support

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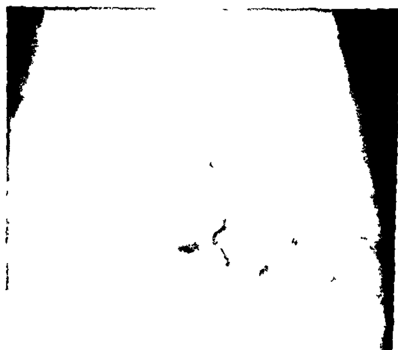


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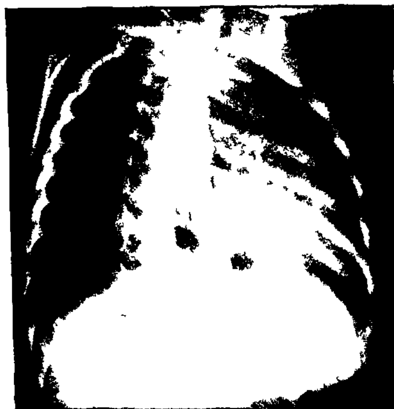


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this statement are the spontaneous improvement in a so-called congenital stricture which may follow the making of a gastrostomy and the return of the stomach to its proper abdominal position after conservative treatment

The following is an example of the 'cure' of a congenital short œsophagus' (Figs 42, 43 and 44)



FIG 44 —X ray taken when the child was three years old

There is no delay in the gullet and the stomach is seen to be completely in the abdominal cavity

The patient was a boy of eighteen months who came under the author's care in January 1947 His mother gave the history that ever since taking solid food he had had difficulty in swallowing and he often regurgitated even fluids An X ray examination (Fig 42) showed a short œsophagus with a stricture at the œsophago gastric junction It seemed to be a straightforward diagnosis and the only question of doubt was whether the condition should be regarded as congenital or whether the primary condition was one of ulceration which had been followed by cicatricial contraction as part of the process of healing Dilatation with gum elastic bougies was carried out and swallowing improved (Fig 43)

Symptoms recurred after the child's discharge from hospital and a further course of treatment was given It was realised at this time that treatment by dilatation was open to the objection that higher reaches of the œsophagus might be opened up to the irritating effects of the gastric juices In view of the severity of the dysphagia however and because no



FIG 45—Barium swallow in a two year-old infant whose symptoms of dysphagia had coincided with starting a solid diet
A cone of stomach has been drawn up through the hiatus

satisfactory alternative treatment could be suggested it was decided to continue

Following this course of dilatation not only did the child's swallowing improve but an X ray taken in March 1949 showed the stomach to be lying completely in the abdomen and the œsophagus appeared to be of normal length (Fig 44)

It seems probable that in the young child the position of the cardia is subject to variations so that herniation of the stomach into the thorax

and œsophagitis are processes which are capable of spontaneous correction (Figs 45 and 46)



Fig 46—The same patient a year later
Treatment with bougies has been followed by complete relief of symptoms.

The important conclusion to be drawn is that in treating these young patients the simplest possible methods should be employed and partial

œsophagectomy and similar drastic procedures should seldom be used

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CHAPTER X

CARDIOSPASM OR ACHALASIA

The terms cardiospasm and achalasia have been used in the past to designate any condition in which there is an obstruction in the passage of food from the œsophagus to the stomach in the absence of an organic stricture. Such a definition is undesirable in that it embraces conditions of purely local spasm which are secondary to some neighbouring pathological process. It is better to restrict the use of the terms to describe a condition in which the whole of the lower two-thirds of the œsophagus is affected by a state of neuro muscular imbalance.

The proper neuro muscular co ordination of the lower two-thirds of the œsophagus may be upset in a variety of different ways and even if the application of the descriptive terms is restricted in the manner suggested cases of cardiospasm or achalasia may be considered as constituting a syndrome rather than implying any clear-cut pathological process.

It is however important to stress the fact that in the condition under discussion a large part of the œsophagus is functioning abnormally even though the most obvious effects may be seen only at the lower end.

Historical Note

In 1671 Thomas Willis in his book *Pharmaceutica rationalis* describes a case in the following words

> A strong man and otherwise healthful enough labouring for a long time with often vomiting he was wont very often though not always presently to cast up whatsoever he had eaten. At length the disease having overcome all remedies he was brought into that condition that growing hungry he would eat until the œsophagus was filled up to the throat in the meantime nothing sliding down into the ventricle he cast up raw (or crude) whatsoever he had taken in when that no medicine could help and he languished away for hunger and every day was in danger of death. I prepared an instrument for him like a rod of a whale bone with a little round button of sponge fixed to the top of it the sick man having taken down meat and drink into his throat presently putting

this down in the œsophagus he did thrust down into the ventricle its orifice having opened the food which otherwise would have come back again and by this means he hath daily taken his sustenance for fifteen years and doth yet use the same machine and is yet alive, and well, who would otherwise perish for want of food '

This patient was evidently suffering from what we would now term achalasia or cardiospasm and the treatment given by Willis in 1674 bears a close resemblance to what might well be advocated today

Other early descriptions were given by Hoffman in 1733 Purton in 1821 and Hannay in 1833 By 1900 about one hundred cases had been reported according to Mikulicz

Plummer reported forty cases from the Mayo Clinic in 1908 and by 1940 the series from this Clinic had been increased to 1 200

Ætiology

The ætiology of the condition has been the subject of much speculation and the great variety of names suggested is an index of the different theories which have been put forward Other terms which have been used to describe this condition are

Œsophagectasia
Phrenospasm
Preventriculosis
Hiatal œsophagismus
Paralytic dilatation of the œsophagus
Idiopathic dilatation of the œsophagus
Spindle-shaped dilatation of the œsophagus

Normal swallowing depends upon a series of properly co ordinated muscular actions (see Chapter I) and when the bolus of food has passed the upper sphincter of the œsophagus its passage down the gullet and into the stomach is largely determined by a smooth wave of peristalsis preceded by a wave of relaxation This smooth wave of peristalsis in turn depends upon the proper functioning of the vagal and sympathetic nerve supplies to the œsophagus

Knight and Adamson produced a condition in cats comparable with cardiospasm in man by carrying out bilateral vagal section They showed moreover that the onset of cardiospasm could be prevented by simultaneous sympathectomy and that following the production of cardiospasm by vagal section relief could be obtained by sympathectomy Unfortunately this experimental work in animals does

not provide the answer for treating the condition in man and the results of dividing the sympathetic supply have, on the whole been disappointing

The cells of Auerbach s plexus have been thought by Hill to be vagal relays, and degeneration of these cells in cases of cardiospasm has been described by Rake The view was put forward by Etzel that a Vitamin B_1 deficiency *is responsible for the degeneration described* The fact that fear and anger can sometimes precipitate or exacerbate an attack *completes the picture and we are left with the conclusion that cardiospasm* will result if the sympathetic action is increased if the vagal action is diminished or if factors are present which hinder the propagation of the vagal effect There are, therefore, *three possible avenues by which the proper muscular co-ordination may be disturbed* Once disturbance has taken place other factors may be introduced which lead to an aggravation of the trouble The nature of these is discussed below

Pathology

In the early stages there are no gross pathological changes As the condition progresses the œsophagus enlarges and its walls become hypertrophied The enlargement of *the œsophagus does not appear to be a simple dilatation following obstruction at the lower end* because no comparable enlargement occurs in *the case of a simple organic stricture* no matter how long it may *be present* In the course of time the œsophagus becomes *lengthened* and as the upper and lower ends are more or less fixed *the gullet comes to assume a sigmoid shape*

Incidence

Men are probably more frequently affected than women and although no age is exempt it commonly starts in the third and fourth decades

Onset and Clinical Course

A remarkable feature of this condition is that in some instances the disturbance of function may have produced no symptoms referable to difficulties in swallowing

One patient was being investigated for pulmonary tuberculosis from which he was shown to be suffering The enlargement of the œsophagus was a complete surprise to his medical advisers Up to the time of the accidental discovery of this patient s cardiospasm he had no difficulty in

swallowing but following this event he developed all the characteristic symptoms of the condition

A woman presented with osteoarthropathy and a search for an underlying cause revealed what was at first mistaken for an old encysted empyema but which on further investigation proved to be an enormously dilated gullet

The examples which have been quoted are exceptional and most patients suffering from cardiospasm complain of symptoms associated with swallowing Occasionally the onset is sudden but more usually it is gradual and can be divided into three stages as suggested by Plummer

(1) Intermittent difficulty in swallowing possibly associated with discomfort and sometimes with attacks of choking
(2) Attacks of regurgitation while eating
(3) Following dilatation of the œsophagus food may accumulate and be regurgitated at irregular intervals

Retrosternal discomfort is a common symptom in the early stages but the occurrence of actual pain should always lead to the suspicion that the diagnosis of cardiospasm is incorrect As the condition progresses and dilatation occurs food entering the œsophagus no longer acts as a stimulus to the production of peristalsis In this way a vicious circle is set up so that larger quantities of food collect in the gullet dilatation is still further increased and the stimulus of food lessened even more (Fig 47)

Negus has drawn attention to this aggravating factor and there seems no doubt that once the mechanism of swallowing has been upset it is one of the most important factors in making the condition progressively worse

When the stage of stagnation is reached food may regurgitate into the mouth at night producing attacks of choking and coughing which disturb the patient s rest and may lead to pulmonary complications The patient may develop signs of toxic absorption and a characteristic complication is pulmonary osteo-arthropathy In long standing cases of cardiospasm there is always the possibility of malignant disease supervening The site of the malignant disease may be at any point in the œsophagus (Plate 1 facing page 41)

Diagnosis

The X ray appearance of cardiospasm is usually characteristic The œsophagus is dilated but the extent to which this occurs varies

very considerably and is usually most marked in long standing case
The barium swallow gives the appearance of a point at the level of th



Fig 47 —Dilatation of the œsophagus in long standing cardiospasm

diaphragm and if the patient is screened it will been seen that th
opaque material is held up for a considerable time and passes int
the stomach only when th hydrostatic pressure has reached a certai

level (Fig 48) At the point of delay there is no irregularity and the barium emerges centrally This contrasts strongly with the irregular appearance of a neoplasm in which the lumen is frequently displaced



Fig 48 —Appearance of the lower end of the œsophagus in cardiospasm

to one or other side In the case of cardiospasm there is usually absence of a gastric air bubble Unless œsophagoscopy is contra indicated by the presence of an aneurysm or extreme age or some

deformity of the spine, this examination should always be made The œsophagoscopic appearance is characteristic In advanced cases the œsophagus is filled with stagnating food contents and the walls of the œsophagus are thrown into redundant folds Once the œsophagus has been emptied however, there is no great tendency for it to fill up again from the stomach and the epithelium is usually remarkably normal looking although occasionally there may be areas of superficial ulceration at any level in the œsophagus, comparable to the stercoral ulceration which may occur in large bowel obstruction

These last two points contrast with what is found in reflux œsophagitis (p 87) where gastric contents are seen to flow back into the œsophagus repeatedly during the course of the examination and where the lower end of the œsophagus is reddened, bleeds easily and may show superficial ulceration

It is most important to distinguish cardiospasm from reflux œsophagitis and to make sure that what is thought to be cardiospasm is *not a spastic condition above a neoplasm in the region of the cardia* A carcinoma in this situation may produce all the symptoms and appearance of a cardiospasm in the early stages probably by direct involvement of the vagal nerve endings It is not always possible to make the differential diagnosis on the first examination and sometimes repeated examinations or even exploration may be called for if the condition which is thought to be cardiospasm does not respond to treatment

Treatment

Minor degrees of cardiospasm may react well to the inhalation of antispasmodic drugs such as octyl nitrite but in general the results of this form of treatment are very disappointing in the more severe cases *As a rule the first line of treatment should be thorough* dilatation by means of the Plummer bag This is very conveniently carried out at the same time as the diagnostic œsophagoscopic examination

Following dilatation by this method about 70 per cent of cases are permanently relieved of their symptoms although subsequent radiological examinations may show no apparent change There may be a slight reduction in the dilatation and the air bubble may reappear in the stomach The symptomatic relief obtained in the face of the unchanged *radiological appearance is probably due to the fact that the* resistance offered by the sphincteric mechanism at the lower end of the œsophagus has been weakened sufficiently to allow a lower hydrostatic

pressure in the œsophagus to overcome it with the result that the patient no longer regurgitates food

If the first dilatation fails the treatment may be repeated, but if this is also a failure, nearly all the cases can be permanently improved by carrying out Heller's operation Heller's operation consists in making a longitudinal incision 2½ in in length over the œsophago gastric junction through the muscular and peritoneal coats down to the mucous membrane of the stomach and œsophagus Other operations such as cardioplasty and œsophago-gastrostomy are not to be recommended because they have the effect of destroying the sphincteric mechanism completely and subjecting the patient to the risk of developing reflux œsophagitis Heller's operation on the other hand appears to reduce the resistance of the sphincter without destroying the mechanism completely The operation may be carried out either through the chest or by an abdominal incision The exposure given by a left sided thoracotomy makes the operation easier but the abdominal approach has an advantage in that it enables a good examination of the abdominal viscera to be made without interfering more than necessary with the œsophageal hiatus of the diaphragm

These considerations determine the choice of approach in any particular patient If it is essential to make a thorough examination of the abdominal viscera, an abdominal incision may be used with advantage but if this step is not considered necessary it is better to make use of a left-sided thoracotomy and so obtain an excellent exposure of the lower end of the gullet

The *abdominal operation* is carried out as follows

Under general anæsthesia the abdomen is opened by an upper mid line incision carried well up to the side of the xiphisternum The stomach and duodenum are carefully examined for any evidence of ulceration or pyloric stenosis The left lobe of the liver is mobilised by dividing the left coronary ligament This ligament is completely devoid of blood vessels except at its extreme base and if care is taken in this division there should be no trouble from hæmorrhage It is essential to mobilise this portion of the liver in order to obtain a view of the œsophago-gastric junction The reflection of peritoneum on to the diaphragm over the œsophageal hiatus is divided and the œsophagus carefully freed by blunt dissection with the finger so that a rubber catheter may be passed around it and used as a retractor to draw the œsophagus downwards in order to make the incision A number of blood vessels will be found crossing the lower end of the

œsophagus and stomach at the point at which it is desired to make the cut These vessels should be clipped and ligatured or undersewn with silk before proceeding A careful incision is now made through the muscular coat of the lower inch of the œsophagus and carried for



Fig 49.—X ray of a woman of twenty six who gave a history of the sudden onset of dysphagia just before her marriage four years previously

Complete symptomatic relief followed a transthoracic Heller's operation

œsophagus and stomach at the point at which it is desired to make the cut. These vessels should be clipped and ligatured or undersewn with silk before proceeding. A careful incision is now made through the muscular coat of the lower inch of the œsophagus and carried for



FIG 49 — X ray of a woman of twenty six who gave a history of the sudden onset of dysphagia just before *her marriage four years* previously.
Complete symptomatic relief followed a transthoracic Heller operation.

about 1 in to 1½ in along the anterior surface of the adjoining part of the stomach This incision must be made with extreme care because the depth of the muscle diminishes when the stomach is reached and it is essential to divide all the muscle fibres along the length of the incision if a good result is to be obtained To do this without opening the mucous membrane is not always easy The rubber catheter which has been used as a retractor is now removed and the left lobe of the liver allowed to fall back into place The abdomen is closed and the patient is treated afterwards in the same way as if he had had a partial gastrectomy that is to say a Ryle s tube should be left in position until the morning following operation and mouth feeding should be started twenty four hours after the operation

Feeds should be small at first and any feeling of distension is an indication for passing the Ryle s tube and making sure that gastric retention is not occurring

If the *trans thoracic approach* is chosen the patient is placed on the right side and the ninth rib resected from the costal margin to the angle The pleura is incised through the bed of the rib The left pulmonary ligament is divided and the lung allowed to collapse

The pleura overlying the lower part of the œsophagus is incised and by blunt dissection with the finger the last 2 in of the gullet are mobilised The œsophageal hiatus of the diaphragm is stretched sufficiently to enable the upper part of the stomach to be drawn into view

The division of the muscle at the œsophago gastric junction is now carried out in a manner similar to that which has already been described The margins of the œsophageal hiatus are carefully sutured to the lower end of the gullet and after making sure that the lung is fully expanded the chest is closed Breathing exercises are started post operatively and radiological examinations are made to make sure that the lung remains fully expanded

The same provisions are made to guard against gastric distension as in the case of the abdominal operation

The results of Heller s operation carefully carried out are extremely satisfactory (Fig 49)

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CHAPTER XI

ŒSOPHAGEAL VARICES

The occurrence of œsophageal bleeding was noted by Galen but no further reference appears to have been made to the subject until Portal's observations in 1803. Peter Frank in 1820 drew attention to the association between portal obstruction and what he regarded as gastric hæmorrhage and in 1840 Rokitansky published an example of fatal hæmorrhage from enlarged œsophageal veins.

In 1853 Gubler pointed out the similarity in the distribution of the veins at each end of the digestive tract and described the arrangement of the veins at the lower end of the œsophagus.

More precise knowledge of the factors involved in the production of œsophageal varices has been forthcoming in recent years. It has become clear, too, that these varices constitute one of the most important complications of portal hypertension, œsophageal hæmorrhage accounting for over half the deaths in patients suffering from this condition. In about 5 per cent of patients who are admitted to hospital for hæmatemesis the bleeding is found to be coming from œsophageal varices.

The mortality in respect of any particular hæmorrhage is variously given as 36–84 per cent and nearly every patient who suffers from a hæmorrhage of this nature is dead within five years.

Portal hypertension is produced by a number of immediate causes which may be separated into two main groups:

(1) Intra hepatic obstruction following damage to the portal channels within the liver.
(2) Extra hepatic obstructions caused by conditions affecting the splenic or portal vein.

Raising the portal pressure produces congestion of the area drained by the portal vein and results in the opening up of communicating channels between the portal and caval systems.

The communicating channels form in the following situations

(1) At either end of the digestive tract producing œsophag varices and hæmorrhoids

(2) In the obliterated veins of the falciform ligament and pa umbilical veins By opening up this embryological ci culation the characteristic caput Medusæ is produced

(3) In those situations where the abdominal viscera come in immediate contact with the abdominal walls without th interposition of peritoneum

The communicating veins which form œsophageal varices lie in th loose areolar tissue under the lining epithelium of the lower œsophagu The veins emerging from this plexus drain above into the azygos an hemiazygos veins and below into the coronary and splenic veins I the presence of portal hypertension the veins of the œsophageal plexu enlarge being unprotected by valves

The fact that these varicose veins are being constantly subjected t changes in intra thoracic pressure and are continually being damage by diaphragmatic movements and the passage of food has bee advanced as the reason for their liability to bleed It must be remem bered however that bleeding is seldom induced in these cases by œsophagoscopy and it seems likely that the most common cause of the bleeding is ulceration which is associated with the regurgitation of gastric secretions into the lower œsophagus This regurgitation occurs when the sphincteric mechanism at the cardia becomes incompetent

Any hæmorrhage which occurs is made more serious by the increased bleeding time which is a feature in many cases of portal hypertension

Symptoms and Signs

The patient complains of a feeling of heaviness behind the xiphi sternum and shortly afterwards produces a quantity of bright red blood by effortless regurgitation Following this, the patient may complain of nausea and may vomit dark blood mixed with gastr contents and clots If this history can be obtained accurately, serves to distinguish œsophageal bleeding from hæmatemesis due to peptic ulcer

Other patients may present themselves less dramatically showin evidence of persistent blood loss from the alimentary tract, but wit nothing pointing to the source from which it comes

Examination of the patient may disclose evidence of portal hyper tension

Confirmation of the diagnosis is obtained by X ray and œsophagoscopic examination

Radiological Examination

X ray examination will show evidence of the veins protruding into the lumen of the œsophagus but in order to do this it may be necessary to employ media of varying consistency and to examine the patient in different positions A feature which serves to distinguish the con dition radiologically from a growth is the fact that the shape of the protrusion can be altered by variations in intra thoracic pressure and by movement of the œsophagus

Œsophagoscopic Examination

Examination with the œsophagoscope shows the characteristic appearance of enlarged veins protruding into the lumen

Immediate Treatment for Massive Hæmorrhage

Blood transfusion may be required but should be restricted to the minimum amount necessary to overcome the dangerous effects of the hæmorrhage Excessive transfusion increases the viscosity of the blood and favours further bleeding

Pressure may be applied at the site of the hæmorrhage by means of a Miller Abbott tube This is introduced so that the bag lies at the level of the lower œsophagus The correct level is shown by X ray examination or in the absence of facilities for radiology by measurement

If necessary the tube can be left in position for forty eight hours and during this time the patient can be fed through the lumen

Treatment Aimed at Lessening the Risk of Further Hæmorrhage

An attempt should be made to differentiate those cases in which the obstruction is intra hepatic from those in which it is extra hepatic The latter group which constitutes Banti s syndrome is more likely to be ameliorated by surgery Tests for liver function liver biopsy and the response to suitable diet are of value in making this distinction Some cases fall into an intermediate group and the selection of cases for operation may be difficult

The diet for these patients should be rich in carbohydrate low in fat

and should contain ample vegetable milk and egg proteins Meat proteins should be kept at a minimum In addition there should be a high intake of all the vitamins and 5–15 gr (0 3 to 1 0 gram) of bile salts should be given daily to facilitate the absorption of fat soluble vitamins

Steps should be taken to diminish the chance of regurgitation of gastric contents and to limit the ulcerating tendency of any regurgitation which does occur To this end the patient should be instructed to avoid lying flat, and to sleep with the head and shoulders well supported on pillows To protect the œsophagus from the risk of ulceration alkaline powders are given in the dry form after each meal and olive oil last thing at night

The operations which have been devised to decrease the risk of further hæmorrhage have approached the problem from several different angles

(1) Direct Reduction of the Portal Blood Flow Splenectomy

Twenty per cent of the blood entering the portal circulation is contributed by the spleen Consequently splenectomy occupies an important place in operations designed to reduce the portal pressure It has been estimated however that in only about 10 per cent of patients is splenectomy alone sufficient to reduce the risk of œsophageal hæmorrhage

(2) Establishment of Anastomoses between the Portal and Caval Circulations

(a) OMENTOPEXY The first attempts to form communicating veins by this method are associated with the names of Talma Drummond and Morison

The operation was devised for the relief of ascites resulting from alcoholic cirrhosis and it was stipulated that the patient should have withstood several tappings and should be free from cardiac or renal disease

An upper abdominal incision is made avoiding the peritoneum in the mid line so as not to injure the enlarged veins of the round ligament of the liver Care is taken at the lower end of the incision to avoid damaging the veins of the caput Medusæ

The patient is placed in the reversed Trendelenburg position This makes it easier to inspect the upper abdominal viscera and encourages the escape of ascitic fluid A supra pubic drainage tube is introduced

The surfaces of the liver and spleen are rubbed with gauze in order to induce adhesions and the adjacent surfaces of peritoneum are treated in the same way.

The great omentum is fixed to the anterior abdominal wall on either side of the mid line by sutures which pass through the abdominal wall and are tied over gauze. In closing the wound the omentum near the mid line may be brought into contact with the rectus muscle. The abdomen is firmly bandaged from above downwards to keep the scarified areas in contact.

This operation by itself is likely to be successful in only a very few cases but used in conjunction with other procedures it is worthy of consideration.

(b) FORMATION OF COMMUNICATING VEINS BY MEDIASTINAL PACKING. This method has been suggested by Som and Garlock and may have a useful part to play in conjunction with other procedures.

(c) ECK'S FISTULA. Direct anastomosis between the portal vein and inferior vena cava was carried out in dogs by von Eck in 1877 and was successfully completed in the human by Rosenstein in 1912. Gammeltoft has recently carried out a careful and critical follow up of patients who were operated upon by Blakemore in the Presbyterian Hospital, New York, between the years 1944 and 1950. His findings indicate that portacaval anastomosis by the suture technique is probably the most satisfactory type of shunt to carry out and with a proper selection and pre operative preparation of the patient is worthy of consideration as a method of treatment.

(d) SPLENO RENAL ANASTOMOSIS. A spleno-renal anastomosis diverts about 40 per cent of the portal blood. The first reports of this operation were encouraging but the after histories of patients who have been treated in this way have not borne out the earlier hopes and most of those surgeons who have had the greatest experience in the method have abandoned it.

The bad long term results have been due in many cases to renal damage caused by the raised renal pressure resulting from the operation.

(3) Operations Directed at the Varices rather than at the Underlying Portal Hypertension

(a) INJECTION. The injection of sclerosing fluid into the veins as part of a larger operation was suggested by Walters in 1933. Pemberton and Moersch saw the possibility of carrying out this procedure

through the œsophagoscope but the method was not applied succes-fully until 1936 when Crafoord and Frenckner injected the varic through the œsophagoscope In 1939 they were able to report th one patient had remained free of symptoms for three years Th method has been used subsequently with some success

(b) Excision of the varices This method is the natural develo ment of treatment by injection It possesses the advantage that can be carried out as part of a larger procedure Objections that t local treatment of the varices does nothing to relieve the underlyi back pressure are met by the fact that when the veins recur they a situated further from the surface and are, therefore less likely cause serious bleeding

(c) Ligation of the coronary vein This was suggested in 19 by Rowntree McIndoe and Walters and carried out in a series patients By itself the procedure is not sufficient to guard against t risk of further hæmorrhage but it has a place when used in conjuncti with other methods

(d) Transection of the stomach and resuture This method is an extension of the procedure of ligature of the coronary vein

(4) *Partial Gastrectomy*

From time to time a patient is subjected to an emergency explora tion on the mistaken diagnosis of hæmorrhage from a peptic ulcer In some of these cases a partial gastrectomy has been carried out with great benefit to the patient even though subsequent examination of the stomach has shown no signs of an ulcer and other evidence has come to light showing that the patient is suffering from œsophageal varices

The explanation of this happy and often unexpected result is two-fold In the first place the complete transection of the stomach including ligature of the coronary vein, serves to decrease the back flow of blood into the varices and secondly by diminishing the gastric secretion any fluid which regurgitates from the stomach into the œso-phagus will be less likely to cause ulceration and hæmorrhage

Partial gastrectomy should be given a high place in the treatment of œsophageal bleeding although it has most often been carried out as the result of an incorrect diagnosis and an erroneous explanation has sometimes been given for the improvement which may follow An inauspicious beginning such as this, has characterised some of the most satisfactory operations in surgery

(5) *Operations which combine some of the principles which have been discussed*

Œsophageal bleeding may occur under such diverse conditions that the nature of the procedure undertaken must vary accordingly and rather than attempt too serious an intervention it may be wiser to be content with a more limited procedure such as splenectomy or ligature of the coronary vein combined with omentopexy and injection of the varices. Each case must be judged on its merits and the operation planned accordingly and possibly modified as the result of the findings at operation.

The relative values of the different procedures which have been described are difficult to assess owing to the variation in the underlying pathology.

A severe degree of liver damage may cause the death of the patient from hepatic insufficiency, even though the risk of œsophageal bleeding has been lessened or removed.

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CHAPTER XII

POUCHES AND DIVERTICULA

Pharyngeal Pouch or Pharyngo œsophageal Diverticulum

A pharyngeal pouch consists of herniation of mucous membrane through a weak point between the circular and oblique fibres of the inferior constrictor muscles of the pharynx (Fig 50) The circular fibres form the crico pharyngeus muscle which is the upper sphincter of the œsophagus and serves to prevent air entering the gullet with each inspiration In normal swallowing contraction of the constrictor muscles of the pharynx propels the bolus downwards and the crico-pharyngeus relaxes and opens the entrance to the œsophagus If the muscular actions are not co ordinated the crico pharyngeus may remain contracted and so prevent the easy passage of the bolus which is forced onwards against the closed sphincter by the constrictors The result of this failure in the normal mechanism is the production of a bulge at the weak point in the pharyngo œsophageal junction

Various explanations have been put forward to explain the occurrence of a diverticulum and it has been suggested that the weakness in the pharyngeal wall may be accentuated by the direct pressure of the larynx on this point A much more satisfactory explanation has been given by Negus who has pointed out that in most cases a pharyngeal diverticulum in the early stages is the result of dysphagia rather than the cause His investigations into comparative anatomy have shown that whereas in animals which use their fore-limbs for locomotion only a powerful crico pharyngeal sphincter is not required Animals which climb trees and man who is descended from this type of animal make great use of the fore-limbs for holding and climbing and this action is assisted by closing the glottis during muscular effort and so fixing the thoracic cage If this mechanism is not to result in the passage of air into the œsophagus it is necessary for a powerful muscular sphincter to be provided at the mouth of the gullet This is probably the explanation of the powerful crico-pharyngeus muscle which is found in man

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Once a bulge has formed there is a tendency for the diverticulum to develop if the underlying cause is still acting Lahey regards the initial bulge as Stage I in the formation of a pouch (Fig 51) A continuation of the cause produces an actual herniation of mucous

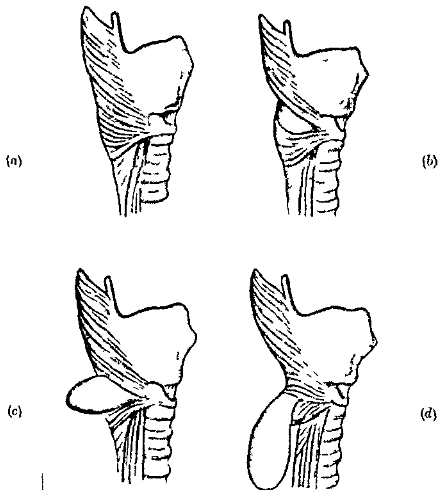


FIG 50 —Pharyngeal diverticula (after Negus)

(a) Muscles f hypopharynx nd upper œs ph gu.
(b) Sep rat on of c rcula and obl q fibres of inf rio constrictor
( ) Mu ous n embrane em rgin to form a pouch
(d) Fnlargement nd downward lisplac ment has taken pl ce

membrane through the muscle which constitutes Stage II Finally Stage III is produced by the enlargement of the sac as the result of the accumulation of food and mucus When this stage is reached the sac drags downwards rotating its orifice through a right angle, with the final result that *the opening of the sac lies in a more or less horizontal plane and in direct continuation with the lumen of the pharynx* When this stage is reached food and instruments will pass more readily into the pouch than into the œsophagus the opening

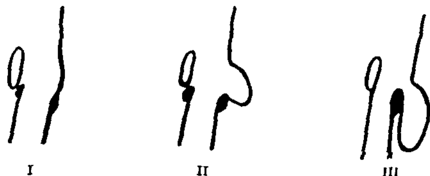


FIG 51 —The three stages in the formation of a pouch

of which lies anteriorly under the lamina of the cricoid cartilage The opening of the œsophagus is further obscured by the appearance of a *well marked ridge between the orifice of the pouch behind and the slit like opening of the œsophagus in front* This ridge represents part of the underlying crico pharyngeus muscle

Symptoms

It is most important to distinguish those symptoms which are due to an underlying spasm from those which may be produced by the sac itself The causes of any underlying spasm which may be present are chronic hypopharyngitis with or without sideropenic anæmia (see Chapter XIII) or cicatricial contraction at the mouth of the œsophagus The symptoms which are characteristic of the diverticulum itself vary according to the stage and development

Stage I A piece of food occasionally becomes held up in the bulge and is dislodged by hawking and clearing the throat

Stage II The small sac which is now present fills up with food and mucus mixed with air Gurgling sounds are often complained of and may be loud enough to be noticed by the patient's friends Regurgita

tion of food into the mouth may result from pressure on the sac, produced by movement of the neck. If this regurgitation occurs at night, food may be inhaled.

Stage III. All the above symptoms become more marked and in addition dysphagia may be a striking feature. The dysphagia may be absent at the beginning of a meal and only develop as the sac becomes full. The patient may notice fullness of the neck, usually on the left side. Pressure on the side of the neck may empty the pouch with regurgitation of food into the mouth accompanied by gurgling noises. Septic absorption may occur in long standing pouches and occasionally a carcinoma may develop.



Fig. 52.—Radiological appearance of pharyngeal pouch.

Differential Diagnosis

Dilatation occurring above a high stricture or web may cause mistakes in diagnosis. Careful X-ray screening however shows the pouch filling up and the opaque material spilling over from the top of the pouch into the œsophagus and should make the diagnosis clear (Fig. 52). Direct inspection shows the size of the pouch and will reveal the presence of inflammatory changes or the rare development of a carcinoma. Instrumentation must be carried out with great care bearing in mind that the diverticulum is entered more readily than the lumen of the œsophagus and unless great care is exercised it is easy to perforate the thin walled sac (Fig. 53).

Treatment

In Stage I the underlying spasm should be treated by dilatation and if anæmia is present this must receive appropriate therapy. The sac itself does not, as a rule, require any special attention.

In more advanced cases treatment must also be directed to the

diverticulum In patients who are unsuitable for operation it may be sufficient to wash out the sac, either through the œsophagoscope or

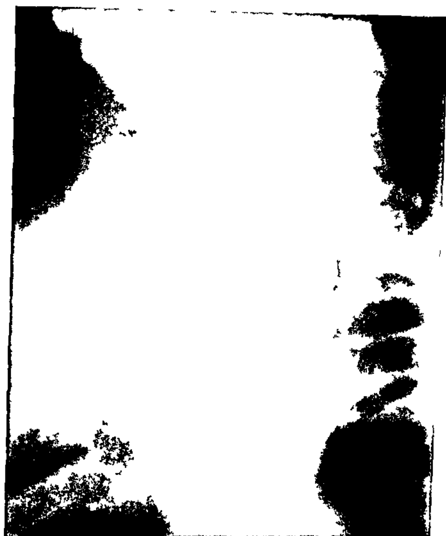


Fig 53 —Long standing pharyngeal pouch in which a carcinoma has developed in the lower part

by the introduction of a soft rubber catheter (Fig 51) Washing out the sac may also be required as a preliminary to surgical excision

The original operations to remove the sac in one stage were accompanied in many instances by death or complicated recoveries usually as the result of infection and leakage at the site of suture producing



FIG 54 —Pharyngeal diverticulum in a man of seventy five

His dysphagia disappeared with conservative tre tment F ve months l ter he reported wit symptoms suggesting a gastr c rcinoma but at operat n he was foun l to have a s mple lesser curve ul er He made a good recovery following a Billroth I partial gast ectomy and has rem ned *symptom free*

mediastinitis This consideration led to the adoption of the two-stage operation the first stage consisting in inverting the sac so that its fundus lay at a higher level than the opening into the oesophagus It has been claimed that inversion of the sac alone has been sufficient to remove all symptoms The disadvantage of the two-stage operation is that in those cases in which the second stage is essential difficulties may be encountered owing to adhesions produced at the first operation Most of the dangers of the early one-stage operations can be avoided and if proper precautions are taken the one-stage procedure can be carried out safely The one-stage operation has been made considerably safer by the use of the antibiotics and should be regarded as the method of choice Many of the complications encountered in the early operations were the result of using thick ligatures and suture material

It was often the practice to tie off the neck of the sac crudely and divide it with the cautery, or to apply carbolic acid to the stump *These procedures often led to local abscess formation which might be followed by stenosis the formation of a fistula or by mediastinal infection The prolonged use of an indwelling stomach tube and the injudicious placing of hard drainage tubes may also produce complications by pressure*

In excising the diverticulum particular care must be given to the following details

(1) *The tissues must be handled delicately and the use of tissue forceps avoided*
(2) *The minimum amount of dissection should be employed to display the sac and its neck*
(3) *Fine suture material must be used and the sutures spaced with care and tied without tension*
(4) *Clamps cautery and carbolic acid should be avoided*
(5) *Drainage tubes should be placed so that they avoid the actual suture line*

Pre-operative Management

The patient should enter hospital a few days *before the operation so that a proper assessment can be made of the general condition For forty eight hours before operation antibiotics should be given During this time if there is any reason to suspect the presence of infection in the sac steps should be taken to wash it out by means of a soft rubber tube*

Examination of the patient after air has been deliberately swallowed by pressing on the sterno mastoid on either side at the level of the cricoid cartilage may elicit gurgling noises from one or other side and give an indication as to the best approach to be made More commonly this is the left side

Operative Procedure

General anæsthesia is given through an endo-tracheal tube An adequate incision is made along the anterior border of the left sterno-cleido-mastoid This incision should extend from the angle of the jaw



FIG 55 —Exposure of the hypopharynx and upper œsophagus by an incision along the anterior border of the sterno mastoid
The thyroid gland has been retracted inward

to the sternum *The platysma is divided and to increase the exposure* the anterior half of the sterno cleido-mastoid may be divided just above its insertion into the sternum The lateral lobe of the thyroid is retracted inwards and the inferior thyroid vessels divided if they appear to be in the way (Fig 55) The carotid sheath and its contents are retracted outwards The retro-pharyngeal space is opened up by blunt dissection and the diverticulum identified (Fig 56) At this stage it is helpful to pass a large œsophageal tube with caution It

will usually enter the sac without difficulty, serving to make this quite clear should there have been any trouble in finding it. By withdrawing the tube a little and pushing it forward again guided by a finger in the wound it can be made to enter the lumen of the œsophagus where it plays a useful part in the next stage of the operation by preventing a too radical removal of the sac with the consequent risk of the production of a stricture.

The sac is held by fine stay sutures and the neck of the sac defined. The *thinned out muscular coat is carefully divided about half an inch*

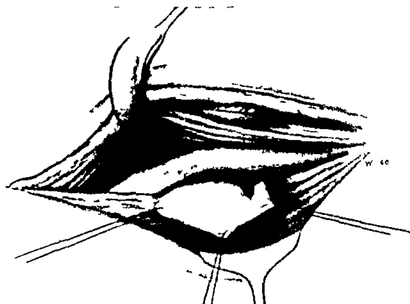


Fig 56.—The carotid sheath and its contents have been retracted outwards and the sac identified and controlled with stay sutures

distal to the neck of the diverticulum so as to leave a cuff of muscle which can be used to cover the suture line. The mucosa is now carefully divided in stages suturing the mucous membrane as each portion is divided. Interrupted silk sutures may be used or a continuous suture of fine catgut. The muscular layer is now approximated with interrupted sutures of fine silk and the suture line *allowed to fall back* into its normal position. The area is dusted with sulphonamide and penicillin powder and a drainage tube introduced to a point near the suture line. The platysma and skin are then approximated with stitches.

Post operative Treatment

The patient may be allowed up on the day following operation Apart from a few sips of water and penicillin solution fluid requirements should be made good by parenteral methods Antibiotics



Fig 57 —Pharyngeal diverticulum treated successfully by one stage excision

should be continued for four or five days On the third day liquid food is allowed sparingly and this is gradually increased to soft solids at the end of the week Normal diet should not be taken until a fortnight after operation (Figs 57 and 58)

Diverticula of the Thoracic Œsophagus

Pouches in the thoracic œsophagus are rare Barrett in 1933 collected from the literature a total of 115 cases They are usually situated in the lower quarter of the thoracic œsophagus

VARIETIES

(1) *Traction* Caused by the adhesion of a point on the œsophagus to an adjacent inflammatory lesion such as a tuberculous lymph node



Fig 58 —Pharyngeal diverticulum treated successfully by one stage excision

(2) *Pulsion* Due to herniation of the mucous membrane through the muscular wall This type may be associated with cardiospasm but they are rare in that condition It has been suggested that there may be a congenital weakness in the œsophageal wall but symptoms do not usually begin until middle life

(3) *Traction pulsion* Barrett has pointed out that a diverticulum which starts as a traction diverticulum may take on the features of the pulsion variety as a result of food entering the sac

Symptoms

In many cases no symptoms are present and the condition may be discovered accidentally as the result of X ray examination carried out for some other purpose Dysphagia may occur and pain may be felt behind the lower end of the sternum Pain may be referred to a point between the shoulder blades Often symptoms occur in attacks with periods of remission in between

Diagnosis

An X ray examination with a barium swallow will usually make the condition clear (Fig 59) It must always be remembered however

that another more serious lesion such as a carcinoma, may be present below the diverticulum which may have no part in the patient's symptoms but unless the possibility of this combination is remembered may lead to the more serious lesion being overlooked

Treatment

Diverticula discovered accidentally and not associated with symptoms require no treatment Occasionally there may be an associated



FIG 59 —Traction diverticulum of the thoracic œsophagus

narrowing of the œsophagus at the level of the neck of the diverticulum and it may be possible to treat this by dilatation and thus to remove the patient's symptoms without the necessity of carrying out any procedure on the diverticulum itself If symptoms are marked usually as a result of the distended pouch dragging downwards and pressing on the œsophagus in much the same way as may be found in the case of the pharyngeal pouch operation may be called for

The operation is carried out by a transthoracic exposure after similar *pre-operative treatment has been given, as already considered* in the case of pharyngo œsophageal diverticulum. In the case of a small pouch it may be sufficient to return the mucous membrane into the lumen of the œsophagus, retain it in that position by a few interrupted silk sutures and cover it over with interrupted silk sutures *approximating the muscular wall*.

If the sac is large, it should be excised. The mucous membrane is sewn up transversely, taking care not to reduce the lumen of the gullet. The œsophageal muscle is carefully sutured over the mucous membrane.

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CHAPTER XIII

SIDEROPENIC DYSPHAGIA OR THE PLUMMER VINSON SYNDROME

A description of this condition should include the names of Paterson and Kelly who first drew attention to the syndrome which may be described as dysphagia associated with anæmia and certain epithelial changes

The patients are composed almost exclusively of women

The symptoms may persist for many years and in a considerable number of cases the patient ultimately develops carcinoma of the mouth or œsophagus

Signs and Symptoms

Dysphagia Difficulty in swallowing occurs with solids and as a rule the patient can manage fluids or soft food without trouble Solids seem to be held up at the level of the crico-pharyngeus muscle and sometimes pain may be complained of at this site

In the course of time the patient may become extremely emaciated

Epithelial changes The tongue often becomes sore and painful and appears smooth and glazed Fissures may occur in the corners of the mouth

The nails may show a tendency to split and in well developed cases present the picture of koilonychia or spoon nails in which the surface of the nail is concave and the edges are turned up

Pruritus of the vulva may occur

Gastritis may be an accompaniment and associated with this there may be achlorhydria but information on this point has not always been readily obtained owing to the fact that the dysphagia present has made test meal examinations difficult

The blood picture The characteristic blood picture is that of a hypochromic anæmia Cases have occurred however in which the clinical syndrome has been observed in the absence of a typical anæmia but with a low serum-iron level For this reason Walden

strom considers that the condition should be designated sideropenic dysphagia

Pathology

As the condition is not fatal unless malignancy supervenes the opportunity for investigating the local pathological changes has been limited The findings in those cases which have come to autopsy and the examination of material removed at œsophagoscopy are those of a chronic inflammatory condition in the pharynx and upper œsophagus Hyperkeratinisation is present and there may be denuded areas Mucus secreting glands are numerous and beneath the epithelium are found aggregations of cells which consist for the most part of lymphocytes with a few polymorphonuclear leucocytes and plasma cells The muscular wall is thicker than normal

Post mortem examination has not shown any gross anatomical obstruction When the syndrome is well developed the appearance of œsophageal webs is characteristic These webs can be seen through the œsophagoscope and demonstrated radiologically Histological examination of a web shows that it consists of two layers of epithelium separated by fibrous tissue These webs are for the most part single but may be multiple They usually occur just below the level of the cricoid cartilage

Radiological Appearances

Radiological examination of the pharynx and upper end of the œsophagus is difficult to carry out satisfactorily and it is necessary to use a medium of thick consistency

The typical changes are seen best in the lateral view and consist of a fine filling defect produced by the web referred to above Occasionally these webs are multiple and in rare cases they are seen occupying a lower level Unless the radiological technique is carried out with care the presence of the web is not seen and the only apparent abnormality is that of the associated spasm together with a bulge in the hypopharynx during deglutition

Œsophagoscopic Examination

The web appears as a crescentic fold If the condition is advanced this fold may extend right round the lumen of the œsophagus to form a circular membrane with a central aperture

Underlying Causes and Treatment

Iron deficiency plays a most important part in the production of this syndrome and the administration of iron in large doses may be sufficient to relieve the patient of all symptoms The view that the iron deficiency is secondary to the dysphagia is untenable because it has been observed that this deficiency may recur without any corresponding relapse in the dysphagic symptoms

The condition may also be improved by giving the entire Vitamin B complex The explanation of this is that disturbances in the metabolism of riboflavine and other factors may be produced by iron deficiency The underlying factor may well be atrophic gastritis and once the condition has become established the resulting dysphagia will add still further to the metabolic disturbances

Treatment consists of giving iron in large doses, together with the entire Vitamin B complex If the dysphagia is severe, preliminary dilatation through the œsophagoscope and later by a swallowed mercury bougie may be essential and will, in any event, hasten the cure

Œsophagoscopic examination should always be carried out to exclude malignant disease For the same reason patients suffering from this syndrome should be followed up for long periods

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CHAPTER XIV

CARCINOMA OF THE ŒSOPHAGUS PATHOLOGY, CLINICAL COURSE AND DIAGNOSIS GENERAL CONSIDERATIONS IN THE CHOICE OF TREATMENT

Squamous-celled carcinoma is the commonest form of new growth of the œsophagus The growth may be anaplastic, or the cells may be well differentiated and show cell nest formation Occasionally basal celled carcinoma occurs Adenocarcinoma may involve the œsophagus as an upward extension from the stomach and in rare instances it may arise in ectopic gastric mucous membrane Some cases of adenocarcinoma of the œsophagus are really examples of carcinoma of the thoracic stomach

About 25 per cent of growths occur in the hypopharynx and upper third of the œsophagus 45 per cent in the middle third and 30 per cent in the lower third

In the œsophagus proper the condition is much more common in men than in women the former accounting for 80 per cent of the cases Post cricoid cancer on the other hand is more common in women in whom it is frequently preceded by the Plummer Vinson syndrome

The majority of the patients fall into the age group of fifty to seventy

Some 2 000 people die annually in Great Britain from cancer of the œsophagus

It is sometimes asserted that the disease is of relatively low malignancy and that its fatal nature is due solely to the fact that vital structures are involved early It is true that in the absence of surgical treatment the involvement of adjacent structures such as the lung or bronchus may result in the death of the patient before widespread metastasis has occurred The mounting numbers of successful resections have however demonstrated that cancer of the œsophagus behaves in much the same way as regards metastasis, as cancer elsewhere in the alimentary canal that is to say about one-third of the cases disseminate

widely at an early stage and the remaining two thirds may remain a local problem for a considerable time

The growth spreads in the submucous layer of the œsophagus and this spread may be far beyond the extent of the lesion as seen through the œsophagoscope or inferred by X ray examination or palpation Direct spread outside the wall of the œsophagus may involve the lung bronchus or trachea the vessels at the root of the lung the pleura or diaphragm the aorta pericardium or heart

In addition to these possibilities of direct spread the lymphatics from the upper third may drain upwards to the cervical lymph nodes from the middle third to the nodes at the bifurcation of the trachea and roots of the lung and from the lower third to the nodes along the lesser curvature and around the coeliac axis and then to the liver

By these various means fistulous communications may be established with the air passages with the resultant pulmonary complications or the erosion of a great vessel by the growth may bring the patient s life to a catastrophic end The recurrent laryngeal nerve may become involved by the primary growth or by a secondary lymph node

Added to all these dangers is the inexorable progress of the stricture itself which first prevents the swallowing of solids progresses until even liquids are difficult or impossible and finally the patient is unable to swallow even his own saliva

Diagnosis

Dysphagia is the symptom which most often causes the patient to seek advice In some cases the first symptoms are those of fatigue and vague ill health which may have been present for some time before dysphagia becomes marked In such patients there may have been abnormal sensations felt on swallowing indigestion or progressive weakness or a period of initial dysphagia may have been followed by a temporary remission only to be succeeded by more severe symptoms

Sometimes the length of history is misleading a patient who has suffered from cardiospasm for years may develop carcinoma and the long history may obscure the true diagnosis (Plate 1) Hiccough or discomfort in the neck may be the first symptom and in the case of growths starting in the hypopharynx hoarseness and very slight difficulties in swallowing may be the only complaint Occasionally enlarged cervical lymph nodes may be the first evidence of a hypopharyngeal growth

In carrying out the examination the heart great vessels and lungs are first screened to exclude any extrinsic cause for the dysphagia Barium emulsion of increasing consistency is then administered and the passage of the medium followed down the œsophagus The shape of the gastric air bubble is noted and to make a complete examination

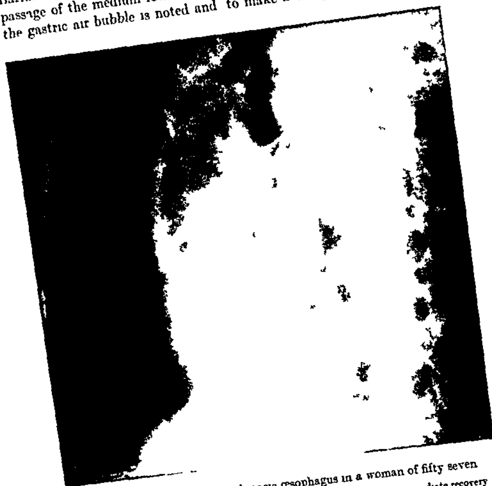


FIG 60 —Carcinoma of the thoracic œsophagus in a woman of fifty seven Resection and supra aortic œsophago-gastrostomy was followed by good immediate recovery

of the lower end it is desirable to place the patient in the Trendelenberg position and by pressing on the epigastrium to force some of the barium against the lower end of the stricture This procedure may disclose a carcinoma of the fundus a diaphragmatic hernia or may demonstrate the fact that the lower œsophageal sphincter is incompetent

overcome the technical problems In spite of all these attempts the number of patients who have received benefit has been very few and in some of these the nature of the obstruction has not been proved histologically This last point is of importance when it is realised how closely certain simple conditions can simulate carcinoma

One great objection to irradiation of the thoracic gullet is the risk of causing a fistula to form earlier than it would in an untreated case

It must be emphasised that this is the present position of irradiation therapy in connection with this disease Improvements in methods of application possibly the combination of this form of therapy with the better access obtained by surgical exposure, may ultimately make it the method of choice

Operation Successful removal of the œsophagus has proved difficult and dangerous This is because of its inaccessibility, its lack of extensibility and the infected nature of its contents which make any blind end left after operation a potential danger In addition to these considerations the lack of a peritoneal coat increases the technical difficulties of making a satisfactory anastomosis Contrary to what is generally believed, the œsophagus has a reasonably good blood supply

Many of these difficulties have been or will be overcome but one great difficulty remains, the state of the patient who commonly forms the object of these operations Most of the patients are elderly, and in addition to the handicap of age, the disease may have pursued its relentless course too long before the diagnosis is made with the result that the patient has deteriorated to such an extent that any major attempt at eradicating the growth is impracticable

It is an unfortunate fact that the disease may have become advanced before dysphagia is urgent, but even so there is opportunity for earlier diagnosis

Historical Note Czerny successfully resected the cervical œsophagus in man as long ago as 1877 and cancer of the cardia was resected by the purely abdominal route by Voelcker (1908), Kummell (1910) and Bircher (1918) These operations were completed by drawing the œsophagus down into the abdomen and anastomosing it with either the stomach or the jejunum However it was not until 1913 that a success was obtained in the thoracic œsophagus This was Torek s famous case who lived for thirteen years without recurrence Torek s case was a great stimulus to surgical interest, but no further success was recorded until Grey Turner reported a case in 1933 The œsophagus was removed in this patient by means of the collo-abdominal or pull

through' method Grey Turner continued to carry out pioneer work on the œsophagus during the years which followed and kept surgical interest alive at a time when the majority of surgeons in this country regarded the problem as beyond the reach of surgery

Meanwhile Ohsawa was obtaining astonishing results in Japan and writing in 1933 described his experiences with 101 cases in the preceding seven years These cases consisted of carcinoma of the œsophagus or carcinoma of the stomach involving the œsophagus In eighteen of these patients the tumour involving the lower end of the œsophagus or cardia was resected with immediate anastomosis No less than eight of these patients survived

Ohsawa s results were not generally known at the time and most surgeons continued to regard the problem in two stages first the removal of the œsophagus and second in the rare event of the patient surviving this ordeal an attempt to restore continuity either by an external rubber tube or by an ante-thoracic œsophagus constructed from skin tubes small intestine or stomach, or a combination of these Garlock achieved a series of successes by these methods and sporadic cases were reported by other surgeons

Adams and Phemister reported a successful case with immediate anastomosis in 1938 and the first successful anastomosis in Europe was reported by Brock in 1942 The operation in this case was carried out for a large myoma The advantages of immediate anastomosis were not fully recognised and in the same volume of the *British Journal of Surgery* as that in which Brock reported his case were articles by Allison (four cases) and Franklin (two cases) In none of these cases was there any attempt to make an immediate restoration of continuity Allison s cases were approached from the left side in the case of growths involving the lower third of the œsophagus and from the right in the case of higher growths Both of the author s cases were approached from the right side Wookey and others had previously pointed out the greater ease of exposing the middle of the œsophagus from the right side

In this country the first successful resection for carcinoma of the lower end with immediate œsophagogastrostomy was reported by Vernon Thompson in 1945

The operation of choice for the lower end now appeared to be standardised and many surgeons notably Garlock Churchill and Sweet showed that successes were no longer to be regarded as freak results but could be obtained in a reasonable proportion of cases

Growths in the middle of the œsophagus proved a difficult problem Garlock removed these from the left abdomino-thoracic approach displacing the upper œsophageal stump to the left of the aortic arch and bringing up the stomach for anastomosis as in cases of cancer of the lower end

This method is still largely followed Ivor Lewis in an Hunterian lecture at the Royal College of Surgeons in 1946, described an operation for dealing with growths in the middle third In this operation the stomach is mobilised at a laparotomy and then a right trans pleural œsophagectomy is carried out and the mobilised stomach brought up for anastomosis

Lewis rightly *pointed out that when all the technical difficulties of* radical resection have been overcome the cure rate may still be low and therefore it is important to ensure that any curative operation which the patient has to undergo should also be palliative when recurrence takes place

Allison carried the surgery of the œsophagus still further by insisting that the limits of removal should be physiological rather than anatomical *and that in growths involving the lower end the chance of cure is* greatly increased by removing the whole of the stomach great omentum and spleen and utilising the small bowel to restore continuity

Factors to be taken into account in determining the method of treatment In arriving at a decision as to the proper treatment to be *followed* for a particular patient certain general principles must be borne in mind

(1) *Evidence of distant metastases* This may take the form of secondary deposits in the liver malignant nodules in the pelvis malignant lymph nodes in the neck paralysis of the vocal cord when the primary growth is at a lower level or evidence of direct involvement of the air passages

The first three of these may be found on careful examination but laparotomy or biopsy may be necessary in order to confirm the clinical *findings* *Involvement of the recurrent laryngeal nerve may be sug*gested by an alteration in the voice or by a persistent hoarseness Direct laryngoscopy will settle the diagnosis Patients whose persistent cough gives rise to the suspicion that the air passages are involved must be examined with the bronchoscope Diagnosis is often confirmed radiologically if a thin medium is used This may pass easily through the fistula into the bronchus and so establish the diagnosis



FIG 62 —Extensive carcinoma of the lower œsophagus

Th p t e t proved to h num rous m tastases H was given consid rabl ymptom tic rel ef by the introdu tion f Souttar tube

A patient who is shown to have any of these forms of distant spread has passed beyond the aid of any surgery directed at the removal of the growth but it may be possible to carry out some procedure which makes the terminal phase less distressing and in certain cases it may be possible to restore the power of swallowing (Fig 62)

(2) *Complete dysphagia with gross deterioration of the general condition* Some patients are seen in whom the malignant stricture has become extreme, although the disease has remained localised It is important to recognise this group because at first sight the impression might be gained that any form of major surgery would be quite impracticable whereas with proper preparation some of these patients may ultimately prove to have a reasonable chance of recovery following excision If the dysphagia is complete and if even the patient's own saliva cannot be swallowed a gastrostomy or jejunostomy should be carried out without delay In these extreme cases a local anæsthetic is desirable for this purpose The decision between a gastrostomy or a jejunostomy rests on whether the situation of the growth will entail bringing up the stomach or the small bowel to restore continuity If there is doubt as to which is preferable, it is probably better to make a gastrostomy The Kader Senn type of gastrostomy is perfectly satisfactory for this purpose If a jejunostomy is made it should be of the Witzel type and care should be taken that it will interfere as little as possible with any subsequent operation

(3) *Dysphagia for solids and ability to swallow liquids* In these patients a gastrostomy or jejunostomy should be avoided Very often by limiting the diet to fortified liquids including milk beaten up eggs butter and adequate vitamins, the general condition of the patient can be greatly improved Solids should be banned because the amount which reaches the stomach may be insignificant and the only effect of attempting to take them is often to block up what small channel the patient may have left in the œsophagus

The Site of the Lesion and its Bearing on the Treatment

(1) *The hypopharynx* Growths in this situation are often treated by irradiation but in patients who are good risks operation is often to be preferred Trotter described methods for exposing the whole of the pharynx and the upper part of the cervical œsophagus He himself obtained brilliant results with these operations but it must be remembered that they present great technical difficulties and are liable

to be complicated by infection The risk of infection may be lessened considerably by the use of antibiotics

An extension of this operation associated with the name of Gluck consists in pharyngo-laryngectomy The precise extent of the removal depends upon how far the disease has spread but in any event the resulting disability is so great that the operation is regarded by many surgeons as being seldom justifiable This view is not universally accepted and Wookey has still further modified the operation and practised it with considerable success

(2) *The post-cricoid region* Some growths in this situation can be benefited by irradiation and in patients who constitute very poor operative risks it may be the best form of treatment

The post cricoid region is reasonably accessible from a surgical point of view and in suitable cases a limited removal may be accomplished by the method devised by Trotter (see Chapter XVI)

The basis of the operation consists in turning back a large broad based skin flap separating the affected portion of œsophagus from its surroundings and tucking the skin flap under the isolated length of œsophagus where it is held in place by sutures Four days later the isolated part of the œsophagus is cut away so that the ends of the gullet open into the gutter formed by the skin flap At a later date this gutter is converted into a tube by making an incision on either side and suturing the skin edges together Various modifications of this operation have been practised Rob has used an ingenious method to overcome the difficulties which are inevitably associated with the formation of skin tubes His method consists in inserting a tube made of tantalum gauze surrounded by fascia lata into the breach left by the removal of part of the œsophagus He has shown that in favourable cases epithelial growth will occur with ultimate restoration of the lumen The same technique has been used to restore breaches in the trachea

This method would seem to offer very attractive possibilities especially when applied to the particularly inaccessible portions of the œsophagus but in the author s hands it has not proved satisfactory

(3) *The lower cervical and upper part of the thoracic œsophagus* Growths in this situation present the greatest problem in œsophageal surgery Encroaching as they do upon a sort of no-man s land lying between the cervical region above and the superior mediastinum below they are placed too low for a Trotter s operation and too high for an intra thoracic œsophago-gastric anastomosis

Any attempt at adequate resection of the affected portion of the œsophagus involves exploration of both the cervical region and the thoracic cavity. The thoracic inlet presents as a small bony ring through which crowd a number of important structures which are very liable to be damaged during the course of the operation.

The difficulties encountered at the thoracic inlet may be lessened by resecting the inner half of the clavicle and part of the first rib and costal cartilage. However, even when the segment of œsophagus has been excised one great difficulty remains, that of restoring the continuity of the gullet. Methods of effecting this have included:

(1) The use of a tantalum gauze tube.
(2) The insertion of a previously prepared skin tube.
(3) Mobilisation of the œsophagus and the carrying out of an œsophago-œsophagostomy.

All these methods are open to the criticism that they are too limited to claim to be an attempt at eradicating the disease, and at the same time are much too severe and uncertain in their results to be regarded as palliative procedures.

These considerations lead the author to the conclusion that in the present state of our knowledge the two proper approaches to this particular problem are:

(a) Excision of the œsophagus from the cardia to a point well above the growth, continuity being restored by bringing the fundus of the stomach up to the neck and anastomosing it to the cervical œsophagus. The details of this operation have been carefully worked out by Sweet and entail exploration of the left side of the chest with division of the diaphragm, followed by exposure and mobilisation of the cervical œsophagus.

In the case of a patient of great age or of one who does not appear to have a reasonable chance of surviving this formidable operation recourse should be made to:

(b) *Purely palliative procedures* such as the introduction of a Souttar's tube.

(ii) *The middle two-fourths of the thoracic œsophagus.* The most satisfactory method of restoring continuity after the resection of growths in this situation is by carrying out an œsophago-gastrostomy and there is little doubt that the mobilisation of the stomach is achieved expeditiously by the abdomino-thoracic approach from the left side. The presence of the aortic arch, however, introduces a complication



Post mortem specimen from a patient 22 years of age who presented with carcinoma of the cervical oesophagus Local excision mobilization of the thoracic oesophagus and oesophago oesophagostomy have been followed by a recurrence in the pharynx

feature If the growth is situated in the lower part of the segment under consideration and is limited in extent it is often possible to resect an adequate amount of œsophagus and still be able to effect a satisfactory anastomosis below the arch of the aorta

If however the line of section has to be placed close to the aortic arch it will be necessary to displace the upper œsophageal segment to the left of the arch and make the anastomosis above or to the left hand side This step which entails freeing the œsophagus more or less blindly and which often entails mobilising the arch of the aorta increases the complexity of the operation and adds considerably to the risk It is better however to accept this risk rather than make an unsatisfactory anastomosis below the arch

If the growth is level with the arch these difficulties are intensified Under these circumstances it is not merely normal œsophagus but the growth itself which has to be separated more or less blindly

The œsophagus in this situation is in contact with the right pleura and it follows that involvement of the latter structure will mean that both pleural cavities will inevitably be opened in operating from the left side *These considerations have led the author and others to* explore growths in this situation from the right side of the chest and there is no doubt that this exposure is easier in every way The extent of the growth can be clearly seen and the arch of the aorta instead of being an embarrassment is a convenient barrier which protects the left pleural cavity When the reparative stage of the operation is reached however certain disadvantages of this approach come to the fore If the stomach is to be used to restore continuity it will be necessary to make an independent abdominal incision in order to effect the necessary mobilisation If this is done after the œsophageal resection it may necessitate altering the patient s position twice during the operation with the inevitable ill effects produced by these movements If on the other hand the gastric mobilisation is carried out first it may be found on opening the chest that the spread of the growth has made removal impracticable and although it is possible to leave the patient with a palliative short circuit it may prove more difficult to do so than if the approach had been made from the left side

Various plans have been put into action to overcome these difficulties Preliminary mobilisation of the stomach followed at a later date by exploration of the œsophagus has been tried by the author Two difficulties are however likely to arise First in the interval between operations adhesions may form to such an extent that the advantages

of the preliminary mobilisation are lost, and secondly two operations carried out in a comparatively short time are not as a rule tolerated well by the sort of patient for whom the procedure is likely to be required. Another approach to this problem is to regard the excision of the œsophagus and the restoration of swallowing as two separate and distinct aims. The author was attracted to the possibility of restoring swallowing by the construction of an ante-thoracic œsophagus as a first stage, with the object of improving the patient's condition so that the resection could be carried out more safely from the right side at a later date.

It was felt that the delays and disappointments so often associated with the construction of an ante-thoracic œsophagus should be cut down to a minimum in view of the presence of malignant disease and in many cases the advanced age of the patient.

With this consideration in mind the mobilised stomach, or a mobilised loop of small bowel, was brought up in front of the bony thorax and anastomosis with the cervical œsophagus made or attempted. The experience of a few cases has convinced the author that this plan can have but little application—the mobilised small bowel in particular showing a great unwillingness to reach as high as the cervical œsophagus.

The conclusion is reached reluctantly that the very real advantages offered by the right-sided approach in the matter of resection are outweighed by the disadvantages which are met with when the restorative part of the operation is attempted. The left-sided approach has the further advantage that, should excision prove impracticable, a palliative short circuit may often be made without undue difficulty.

This region can be placed second in difficulty to (3) above and many patients are encountered whose age and general condition, coupled with the unfavourable position of the growth, make the risk of operation unjustifiable—in these patients it is better to rest content with the introduction of a Souttar's tube.

(5) *The lower fourth of the thoracic œsophagus.* Growths in this region are best explored by the left-sided abdomino-thoracic approach. If resection is possible and the growth has not reached to the extreme lower end of the œsophagus, restoration of continuity is effected by an œsophago-gastrostomy just below the root of the lung. Sufficient stomach should be excised to ensure that the lymph nodes lying between the cardia and the left gastric artery are included in the resection (Fig. 63).

(b) *Growths involving the cardia* The best approach is by the left sided abdomino thoracic incision The fact that the cardia is involved means that in order to carry out an adequate excision a large part of



FIG 63 —Carcinoma of the thoracic œsophagus

Resection was carried out and continuity restored by œsophagogastrostomy The immediate recovery was uninterrupted

the stomach must be removed Allison has drawn attention to the necessity for removing as much as possible of the lymphatic spread and has shown that this can best be achieved by removing the whole

stomach and lower œsophagus together with certain surrounding structures in the form of a block dissection. This block dissection is well tolerated by the patient and because much of the dissection is



FIG 64 — Abdomino thoracic block dissection of the stomach

The stomach which has been laid open at 1 shows an extensive carcinoma of the cardia involving the lower œsophagus. The specimen also includes the spleen, tail of pancreas, great omentum and gastro-colic omentum. The post-operative course was smooth.

carried out in an almost bloodless plane is often far less productive of shock than a less radical removal (Fig 64). The extent of the block removed depends upon what is found at operation and on the opinion of the surgeon. In the author's view the aim should be to

stomach and lower œsophagus together with certain surrounding structures in the form of a block dissection. This block dissection is well tolerated by the patient and because much of the dissection is



FIG 64.—Abdomino-thoracic block dissection of the stomach

The stomach has been laid open and shows an extensive carcinoma of the cardia involving the lower œsophagus. The specimen also includes the spleen, tail of pancreas, great omentum and gastro-colic omentum. The post-operative course was smooth.

carried out in an almost bloodless plane is often far less productive of shock than a less radical removal (Fig 64). The extent of the block removed depends upon what is found at operation and on the opinion of the surgeon. In the author's view the aim should be to

remove the last quarter of the œsophagus the whole of the stomach great omentum spleen and tail of pancreas together with the fringe of diaphragm surrounding the œsophageal hiatus and the lymph nodes



FIG 65 —An unusual case of a woman of only forty two who had a carcinoma affecting the middle of the thoracic œ ophagus

E pl t n showed extension to the less c rvat re f the stom ch I vi w of the p tient s age resection was con idered just fiabl It involved the remov l of th great part of th th ra œs ph gus together w th a block dissect on of the stomach The Roux loop can be een above the t c arch Th pati t l ved f l ven month

lying around the left gastric artery Restoration of continuity is effected by Roux s anastomosis en Y or if the small bowel is very mobile by utilising an undivided loop (Fig 65)

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CHAPTER XX

EXPLORATION OF THE ŒSOPHAGUS FOR CANCER THE PREPARATION OF THE PATIENT

Many factors have helped to lessen the hazards of this very dangerous form of surgery one of the most important and one not always appreciated being the proper preparation of the patient Only a few years ago most surgeons who were interested in œsophageal surgery were accustomed to carry out gastrostomy or jejunostomy and then proceed to the major operation about a fortnight later During this fortnight of gastrostomy feeding attention was paid to the teeth and any other obvious source of infection and as a rule little else was done Under this regime most of the patients who came to operation were still grossly undernourished and in some cases the disturbance pro duced by the gastrostomy and the fact that the gastrostomy diet was often inadequate resulted in the patient being in a worse condition than when first seen Considerable improvement in this state of affairs was effected when it was realised that the gastrostomy diets given were often grossly deficient both in vitamins and calories Even the most careful attention to the gastrostomy diet however seldom did more than rescue the patient from starvation

In an ingenious attempt to improve the results of gastrostomy feed ing one surgeon used to bring an attractively cooked meal to the bed side and then pass it through a mincing machine in front of the patient and inject it into the gastrostomy tube with a modified grease gun This was an important recognition of the fact that in many cases the actual gastrostomy does little more than prevent the patient from deteriorating still further If the patient is to have a reasonable chance of surviving the operation it is essential to make a determined effort to make good the lack of nutrition

Improving nutrition In order to be able to assess the amount of subsequent improvement it is a help if the patient is weighed ac curately on admission and an estimate made of the plasma proteins

hæmoglobin and red cells If these investigations show a gross degree of undernourishment a preliminary blood transfusion should be given

Gastrostomy or jejunostomy should not be carried out if the patient *is able to swallow fluids* If the patient is quite unable to take fluids and a gastrostomy has to be made, it will often be found that drinking can be resumed after a *few days, especially if measures have been taken* to combat the local infection which is a very common accompaniment of cancer of the œsophagus

If the ability to swallow fluids has been preserved, or has been regained the patient should be strictly enjoined not to attempt to eat any solid food The improvement in swallowing may be so great after a few days of liquid diet that the patient is tempted to try solids and *the nurses and medical attendants are usually only too willing to aid* and abet this natural desire It should be explained carefully to all *concerned that the only effect of trying to eat solid food will be to* block up the narrow lumen and effectively prevent the passage of the liquid diet which alone is able to pass freely into the stomach The importance of taking a sufficient quantity of the liquid diet must be urged and in order to carry this out any ideas of set times for meals must be *abandoned The patient must be provided with a jug of* fortified milk by the bedside and encouraged to drink as often as possible Some patients find this diet extremely unpalatable but if the reason for it is explained, most will co-operate readily

Most patients will appreciate having the diet varied during the day and for this purpose they may be given drinks of fruit juice, tea or alcohol if they desire it

The composition of the fortified milk which has been found to be satisfactory is as follows

2 eggs
2 oz of sugar
1 teaspoonful of salt
2 oz of National dried milk (full cream)
1 oz of butter
Brandy flavouring if desired
2 pints of milk

Vitamins and ferrous sulphate are given separately

The patient should be encouraged to take at least 4 pints of the fortified milk during the day

The pulmonary and cardiovascular *systems* The state of the lungs and heart is assessed with the help of a physician Various pulmonary

complications such as fibrosis, lipoid pneumonia or bronchiectasis may be present Breathing exercises under proper supervision and in the fresh air if possible postural drainage when required and the encouragement of expectoration will effect a great improvement in the pulmonary ventilation Smoking should be limited and stopped completely for two days before the operation

Oral hygiene It is unwise to embark on any large scale programme of dental extraction because the time available is limited and if many teeth have to be removed the sepsis which is stirred up may take time to settle down Loose teeth however must be removed and an injection of penicillin should be given beforehand For the remainder it is better to rely on thorough mechanical cleansing and the frequent use of mouth washes The mechanical cleansing can be carried out by the patient rubbing the teeth and gums thoroughly with a finger dipped in moistened salt and following this up with a mouth wash (Glycerine of phenol 1 fl oz water to 1 pint) To complete the cleansing process the patient sips a little dilute hydrogen peroxide solution (Liquor hydrogen peroxide 1 fl drachm water 1 fl oz) This removes debris from the region of the growth and helps to diminish infection

Care of the bowels The prolonged starvation from which many of these patients have suffered may have led to the accumulation of hard scybalæ in the rectum and lower colon This accumulation should be attended to by means of enemata and if necessary by manual removal These measures together with the improved diet will usually result in the restoration of normal bowel action

Urinary system Mild prostatic symptoms may occur in a number of these patients and although little can be done before the major operation on the gullet note should be taken of any slight urinary symptoms so that particular care may be taken post-operatively to guard against any urinary obstruction which may develop

General measures Most patients suffering from cancer of the œsophagus appreciate both the seriousness of their complaint and the severity of the operation they are shortly to undergo The extreme depression which may be present when the patient is first seen begins to lessen after a few days of fortified milk diet and as strength returns hope is regained The reasons for carrying out the measures discussed above should be carefully explained to the patient who is usually relieved to learn that an active participation in the exercises and other details of preparation will make an important contribution to the success of the operation

Encouragement should be given to walk about, take baths and generally remain as active as possible Three or four weeks can often *be spent with advantage on this period of preparation*

Antibiotics Three days before operation the administration of antibiotics is started

Skin preparation The area of preparation being necessarily very large it is particularly important to avoid any agents which may produce irritation of the skin

The thorough use of soap and water is the best preliminary preparation and before the patient is taken to the operating theatre the whole area is painted with Cetavlon solution

Pre operative medication For an adult under sixty years of age an injection of

Omnopon gr $\frac{1}{3}$ (gram 0·02)
Scopolamine gr $\frac{1}{150}$ (gram 0 0004)

is given one hour before operation For older patients or for those whose general condition is very poor it is better to substitute an injection of

Morphia gr $\frac{1}{6}$ (gram 0 01)
Atropin gr $\frac{1}{100}$ (gram 0 0006)

CHAPTER XVI

OPERATIONS FOR CANCER OF THE HYPOPHARYNX AND CERVICAL ŒSOPHAGUS BY THE CERVICAL ROUTE

The purely cervical approach may be used when faced with growths in the hypopharynx in the post cricoid region and in the case of cancer of the cervical œsophagus in which there is a sufficient length of healthy œsophagus above the thoracic inlet to make this type of excision satisfactory

Billroth carried out experimental resections of the cervical œsophagus in animals in 1871 but it was his assistant Czerny who reported the first successful resection in man in 1877

The surgery of this region was placed on a sound foundation by Trotter and many of the present day procedures are modifications of the operations described by him Removal of the larynx together with part of the hypopharynx and cervical œsophagus was described by Gluck

All these operations require an extremely high standard of surgical technique and what is equally important a most careful selection of cases These considerations together with the fact that loss of the larynx should this prove necessary is often regarded as an unjustifiable mutilation have resulted in a tendency to neglect the surgical approach to this problem and an easier solution has often been sought in treatment by irradiation Treatment by irradiation however often proves disappointing and if the failures are not so obvious as those of surgery it is often because they are to be found in the homes of the patients rather than in the wards of the hospital

Improvements and modifications in the operative management have been introduced and these improvements have reached a new high peak in the hands of Wookey whose work forms the basis of the cervical procedures which are described below

This type of operation should not be undertaken if the regional lymph nodes are already invaded

Hypopharyngeal Growths involving the Larynx

For growths invading the back of the larynx Wookey *carries out the* following excision

A large skin flap, which includes the subcutaneous fat and platysma is reflected (*Fig 66*) *The base of the flap must be wide and may be placed on either side of the neck according to the position of the growth*

The lower part of the sterno-mastoid muscle is removed on the same

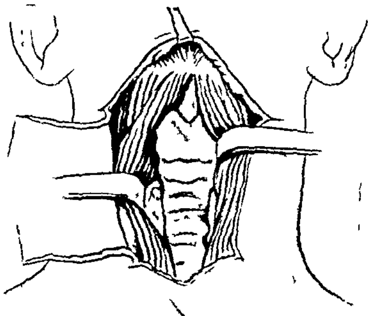


FIG 66—Resection of the hypopharynx and larynx (After Wookey)

side as the base of the skin flap the upper part of the muscle being left in order not to interfere with the blood supply to the skin The skin flap is covered with a warm saline pack The thyroid isthmus is *divided and dissected from the trachea and the half of the gland lying* on the same side as the base of the flap is removed

The trachea is divided transversely just below the cricoid cartilage and a cuff type of endotracheal tube introduced into the distal end *through which anæsthesia is maintained* The pharynx is separated from the prevertebral fascia up to the level of the body of the hyoid The pharynx is now opened transversely just below the epiglottis and

an inspection of the interior carried out in order to estimate the proper level for the division of the pharynx The œsophagus is separated from the trachea in the lower part of the wound and divided taking care to preserve as much healthy œsophagus as possible By this means the hypopharynx larynx and a small part of the cervical œsophagus are removed in one block (Fig 67)

Careful attention is paid to all bleeding points

The skin flap is replaced so that it lies on the prevertebral fascia to which it is secured by two longitudinally placed rows of interrupted



FIG 67 —The trachea has been divided and the pharynx opened transversely (After Wookey)

sutures The upper border of the skin flap is now sutured to the cut edge of the pharynx starting posteriorly and continuing around to the front of the pharynx (Fig 68) The lower edge of the skin flap is *sutured in a similar manner to the cut œsophagus The suturing which* has been described is all carried out with fine chromic catgut the sutures are interrupted and are closely placed (Fig 69)

The raw area which is left is partially covered with the redundant part of the skin flap and Thiersch grafts are applied to the remainder A duodenal tube is passed down into the stomach and its upper end brought out through the nose

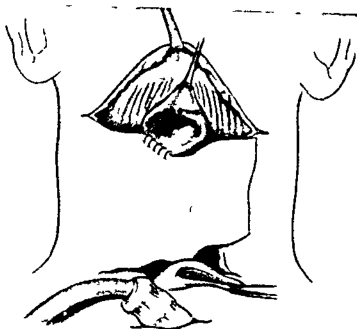


FIG 68.—The formation of the gutter (After Wookey)

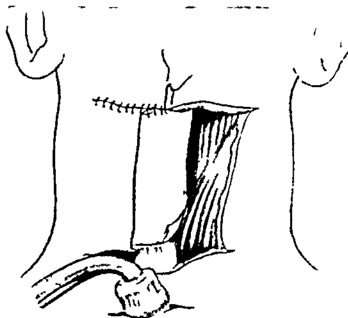


FIG 69.—The gutter has been completed (After Wookey)

The cut end of the trachea is sutured to the skin leaving about ¼ in projecting above the surface A tracheotomy tube is introduced and the patient is placed in an oxygen tent A blood transfusion is given during the operation and blood or other intravenous fluid continued subsequently as required A careful watch is necessary to make sure that the airway is kept free Feeds are given through the duodenal tube and about five weeks should be allowed to elapse before the

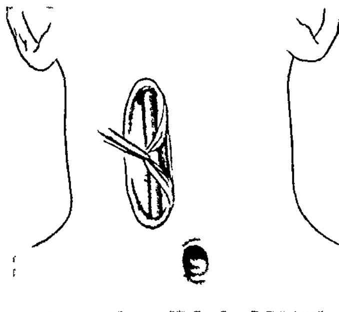


FIG 70—Conversion of the skin gutter into a tube (After Wookey)

reconstruction is completed by converting the gutter in the neck into a tube (Figs 70 and 71)

When the wound has completely healed the duodenal tube is removed and the patient allowed to take first liquids and at a later date solids by the mouth

Post cricoid Growths not involving the Larynx and Growths of the Cervical Œsophagus in which there is Sufficient Healthy Œsophagus above the Thoracic Inlet

A wide based skin flap is reflected as before the base of the flap being placed on the side where the greatest difficulty is to be expected

The sterno-hyoid and sterno thyroid muscles are divided on this side, the thyroid vessels ligatured and divided and the lobe of the thyroid retracted towards the mid line Care is taken to avoid damaging the recurrent laryngeal nerve The anterior belly of the omohyoid is divided and the carotid sheath and its contents retracted outwards *The œsophagus* and hypopharynx are separated from the trachea and larynx in front and from the prevertebral fascia behind *The gullet* is divided well above and below the growth

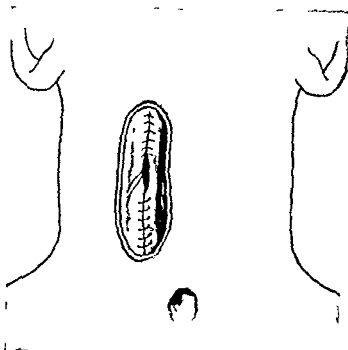


FIG 71 —Skin tube completed (After Wookey)

The skin flap is drawn over beyond the mid line where it is attached to the prevertebral fascia with a series of interrupted catgut sutures (Fig 72) The borders of the skin flap are now sutured to the cut edges of the gullet above and below, as before starting at the back and working around to the front In this way a deep sulcus or gutter is formed which replaces the part of the œsophagus which has been removed The mobilised lobe of the thyroid is excised and the redundant part of the skin flap used to cover as much as possible of the raw surface the remainder being covered with Thiersch grafts

A duodenal tube is passed down the œsophagus into the stomach, the upper end being brought out through the nose Wookey recommends making a tracheotomy at the end of the operation in order to forestall

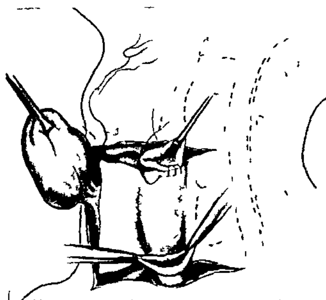


FIG 72 —Resection of post cricoid growth in which the larynx is not involved (After Wookey)

any post operative œdema The tracheotomy tube is removed after a few days

The conversion of the gutter into a skin tube is effected in a manner similar to that which has already been described

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CHAPTER XVII

PARTIAL ŒSOPHAGECTOMY WITH RESTORATION OF CONTINUITY BY INTRA THORACIC ŒSOPHAGO-GASTROSTOMY

This procedure is suitable for growths situated anywhere in the lower three-quarters of the thoracic œsophagus provided that there is no gross involvement of the stomach It is also suitable for the comparatively infrequent occasions when it is necessary to resect part of the œsophagus for non malignant conditions

The margin of safety in these operations is so small that it is essential that every detail should be considered beforehand and so far as is possible difficulties must be foreseen and forestalled The operative procedure is described step by step in order to draw attention to those details and difficulties which the author has found to be of importance

Anæsthesia General anæsthesia administered through an endotracheal tube and supplemented by relaxant drugs has proved satisfactory The various steps of the operation are arranged in such a manner that the anæsthetist is enabled to inflate the lung at regular intervals without interfering with the work of the surgeon

Operation The steps of the operation are as follows

(i) An intravenous drip of glucose saline is set up by tying a cannula into a convenient vein A vein on the dorsum of the left hand is often suitable

An adequate supply of matched blood is ready for use as required during the course of the operation

(ii) The blood pressure cuff and the diathermy pad are arranged

(iii) The patient is placed in the right lateral position (Fig 73) The proper arrangement of the patient is a most important detail and steps must be taken to ensure that the position is maintained during the operation The patient s back is placed level with the edge of the table The left arm is bandaged to an arm rest and drawn well forward so as to open up the interval between the vertebral border of the

scapula and the spine The right thigh is flexed and the left extended The patient is prevented from rolling into the prone position by a rubber pad which rests against the front of the chest and is held by a bracket attached to the edge of the table This pad must be arranged with care so that it does not encroach upon the operative field The patient is further secured by a broad strap passing around the hips and under the table

A wooden wedge is introduced beneath the thorax midway between the nipple line and the costal margin A wide area of skin is painted

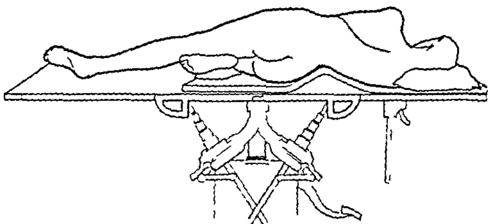


Fig 73 — The right lateral position for exploration of the œsophagus

with Cetavlon This area should extend from the nape of the neck above to the crest of the ilium below, and beyond the mid line both in front and behind

The operative field is draped with sterile towels and if green towels are used it is as well to have a small white one arranged vertically at the level of the patient s neck This enables the anæsthetist to form a true opinion of the patient s colour during the course of the operation

(iv) *The skin incision* This runs along the course of the seventh eighth or ninth rib according to the build of the patient and the level of the growth The skin incision is carried forwards across the costal margin as far as the mid line and upwards in the interval between the spine and the vertebral border of the scapula Towels are applied to the skin edges

(v) The incision is deepened to expose the selected rib the cutting current of the diathermy being used for this purpose Vessels which continue to bleed are secured with artery forceps and ligatured

(vi) The selected rib is resected sub-periosteally from the costal margin to the costo-transverse articulation

(vii) The intercostal vessels are isolated and ligatured as far back as possible The intercostal nerve is divided and a portion of the nerve removed

(viii) The pleura is opened through the bed of the rib and the lung allowed to collapse slowly The incision in the pleura is completed and a preliminary palpation of the growth carried out

(ix) The left phrenic nerve is crushed as it passes to the diaphragm The diaphragm is picked up with stay sutures and incised about mid way between the œsophageal hiatus and the costal margin Two fingers are introduced through the opening to protect the underlying spleen and left lobe of the liver and the incision is enlarged inwards to the œsophageal hiatus Branches of the inferior phrenic artery are encountered and tied The incision in the diaphragm is completed in an outward direction and the costal margin divided

(x) The incision is carried forwards from the costal margin to divide the peritoneum and muscles of the anterior abdominal wall as far as the mid line

(xi) Should the preliminary palpation show that the growth is high and that displacement of the œsophagus above the arch of the aorta will be required it is advisable to remove another rib at this stage The third or fourth rib will often be found suitable The selected rib is resected and the bed of the rib incised to provide an additional and higher exposure of the operative field

(xii) The left pulmonary ligament is divided The pleura is now incised over the œsophagus taking care to avoid the part affected by the growth It is sometimes an advantage to inject saline beneath the pleura before making the incision (Plate 4b facing page 184)

(xiii) Separation of the œsophagus is carried out where possible by blunt dissection with the finger Several vessels entering the œsophagus posteriorly need to be divided Both vagi are divided Opening the opposite pleura may be unavoidable owing to the extension of the growth but great care should be taken not to open it unnecessarily Particular gentleness must be exercised at the level of the root of the lung and behind the arch of the aorta should it be necessary to mobilise the œsophagus to this level (Fig 74)

(xiv) The spleen is removed

(xv) The stomach is mobilised by dividing the gastro-colic omentum almost to the pylorus and by securing the left gastric artery and

dividing it close to its origin The arterial arcades are preserved In dividing the gastro-colic omentum a wide fringe should be left attached to the stomach at the fundus This piece of omentum can be used later to wrap round and reinforce the anastomosis

(xvi) The stomach is divided at the cardiac end and the opening closed with a *double layer* of sutures, clamps being used to avoid contamination

(xvii) The decision has now to be made as to the level of the resection If the anastomosis can be safely made below the arch of the

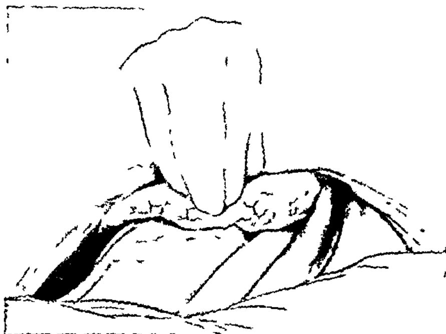


FIG 74 —The arch of the aorta can be seen, and the œsophagus has been mobilised as far as the lower border of the arch

aorta, the operation is easier and carries a lower mortality than if it has to be placed above On the other hand if the anastomosis is close to the under surface of the arch, the introduction of the sutures may be extremely difficult with the result that a leak may occur subsequently In these circumstances it is better to accept the slightly increased operative mortality and make the anastomosis above the arch Should this step be necessary, it is a great help to mobilise the arch of the aorta To do this the pleura is carefully incised along part of the convex border and the finger introduced to enlarge the opening and identify

the upper two or three aortic intercostal arteries before securing and dividing them

The arch of the aorta can now be held forward gently and the additional space which is gained enables the separation of the part of the œsophagus to the right of the arch to be effected with comparative safety

If the growth itself is situated at the level of the arch particular gentleness must be exercised bearing in mind the proximity of the right pleura and vena azygos arch, as well as the left recurrent laryngeal nerve and thoracic duct When the œsophagus has been freed it is drawn through the incision in the pleura so that it lies in front and to the left of the arch It is very easy for contamination to occur while this is being done and to prevent this the cut end of the œsophagus should be sutured carefully

Having displaced the gullet in this way, it is inspected with great care in order to select the level of section It must be remembered that the local malignant invasion extends considerably further than palpation would suggest and also that the segmental arrangement of the arterial supply to the œsophagus makes it important not to carry the mobilisation too far above the line of section

(xviii) *The anastomosis* The details of this are similar whether it has to be carried above or below the arch of the aorta Before dividing the œsophagus stay sutures are introduced the area is carefully packed and an aspirator is at hand to prevent any contamination

No clamp is applied to the upper œsophageal segment but it is convenient to apply one below the line of section where it serves to prevent leakage of œsophageal contents from below and makes it easier to steady the œsophagus while it is being divided When dividing the œsophagus it is a good plan to cut the muscle all round so as to expose the thick mucous membrane like the inner tube of a tyre The mucous membrane can then be divided at a more distal level By this means the mucous membrane which is the toughest layer of the œsophagus is made easily accessible for the subsequent suturing An intestinal clamp is applied transversely across the fundus of the stomach so that about an inch of stomach projects beyond the clamp A transverse incision is made through the anterior wall of the stomach corresponding in length to the cut edge of the œsophagus The gastric incision should be placed well away from the extremity of the stomach so that the latter may be brought up well behind the line of anastomosis Interrupted mattress sutures of silk three or four

in number are now passed through all layers of what is to be the posterior part of the anastomosis Each suture passes from within the lumen of the œsophagus to the outer surface then through all coats of the stomach going from the peritoneal to the mucous surface the stitch then leaves the stomach passing from within outwards and re-enters the œsophagus passing from without inwards These stitches are left long and untied and the œsophagus and stomach are held well apart until all the mattress sutures have been placed Each suture is now tied with great care, the gastric clamp being drawn up to the œsophagus while this is being done so that no strain is placed on the stitches The sutures should be tied just firmly enough to ensure

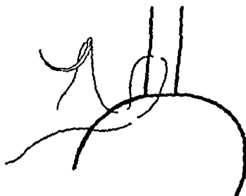


FIG 75 —The introduction of the special Lembert suture at either end of the anastomosis

apposition but not so tightly that they will interfere with the blood supply

A continuous suture of fine chromic catgut is now started at one end of the posterior layer of the anastomosis This is carried right along the posterior part of the anastomosis as a simple over and over stitch passing through all layers On reaching the corner the stitch is passed from within outwards through all coats of the anterior part of the anastomosis and so back to the start An interrupted silk suture is now introduced to protect either extremity of the anastomosis as suggested by Tanner (Fig 75) Each stitch picks up the stomach just behind the œsophagus it then passes through the muscular coat of the edge of the œsophagus and finally picks up the stomach in front of the œsophagus When this stitch is tied it results in the extremity of the anastomosis being protected by peritoneal covered gastric muscle Before completing the anterior layer of the anastomosis a small bore

tube is introduced one end of which is passed into the stomach and the other end up the œsophagus into the mouth where it is recovered This tube is used subsequently to aspirate the stomach and later on for feeding purposes

The anterior through and through layer is reinforced by interrupted silk sutures placed transversely to the line of the anastomosis Care must be taken to draw the stomach up to the œsophagus when tying these sutures because the œsophageal muscle is extremely friable

(xix) The packs surrounding the area are now removed and penicillin powder is dusted around the anastomosis The stomach is gently

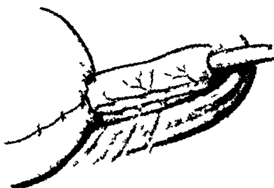


FIG 76—The œsophagus has been displaced to the left of the arch of the aorta and the stomach brought up and anastomosis completed

Interrupted sutures between the stomach and parietal pleura take the strain from the suture line and care has been taken to stitch the diaphragm to the stomach

drawn upwards to remove all strain from the anastomosis and fixed to the pleura with silk stitches

If a fringe of omentum is available it is drawn across the anastomosis and sutured in position The whole of the intra thoracic part of the stomach is stitched to the edge of the pleura bordering the œsophageal bed (Fig 76)

(xx) *Repair of the diaphragm* The stomach is carefully stitched to the edge of the diaphragm so as not to leave any aperture through which small bowel may find its way The rest of the incision in the diaphragm is approximated with a continuous stitch of strong catgut which is carried under the costal margin to close the peritoneum

(xxi) *Closure of the chest wound* The bridge is lowered or the wedge under the thorax removed, and an intercostal drainage tube introduced

through a separate skin incision and connected up with a water seal drainage bottle The lung is expanded and carefully examined for any portions which remain in a collapsed state These collapsed portions can be made to expand by gently compressing the neighbouring parts of the lung The thorax is closed by a continuous suture of strong catgut, which includes both the bed of the rib and the intercostal muscles A second and third layer of continuous catgut approximate the muscles of the chest wall, the lung being kept expanded until the thorax is airtight

The incision in the abdominal muscles is repaired and the skin approximated with interrupted sutures Dressings are applied and kept in position with adhesive strapping arranged so as to interfere as little as possible with respiration All mucus is aspirated from the trachea

The patient s bed is brought to the theatre in order to avoid any unnecessary manipulations which seem to produce a fall in pressure, *even though they are carried out very gently* On return to the ward an oxygen tent is put in position

CHAPTER XVIII

"BLOCK DISSECTION" OF THE STOMACH AND LOWER ŒSOPHAGUS

The arrangement of the lymphatics draining the stomach has been known for many years and it is recognised that the operation of partial gastrectomy cannot be regarded as a radical procedure for the treatment of cancer which involves this organ When however a growth is situated in the distal half of the stomach it is usually possible to carry out a wide partial gastrectomy by the abdominal route and if, as is often the case the patient is elderly and frail it is expedient to be content with this limited palliative operation rather than to court the higher immediate mortality which is associated with a block resection

These considerations no longer apply if the growth arises in or invades the lowest part of the œsophagus or the proximal half of the stomach Under these circumstances it is not possible to carry out an adequate resection nor to effect a sound anastomosis by the abdominal route alone

Allison has drawn attention to the advantages of carrying out a block dissection of the stomach together with certain of its attachments and by showing that this can be done with a reasonable degree of safety by the abdomino thoracic approach he has made a great contribution to surgery

Allison has demonstrated conclusively that under certain conditions an extensive block dissection of the stomach may be less productive of shock and disturbance to the patient than a partial gastrectomy This apparent paradox is explained by the fact that with the wide exposure afforded by the abdomino thoracic incision it is possible to free the stomach with certain of its attachments by what amounts to an almost bloodless dissection By this dissection which is described in detail below the entire stomach together with the lowest part of the œsophagus a fringe of diaphragm the spleen the tail of the pancreas the whole of the great omentum and the lymph nodes

surrounding the left gastric artery are removed en bloc (Fig 77) It has been suggested that this procedure should be adopted in all cases of cancer of the stomach wherever the growth is situated, but in the author s opinion there is still a place for the purely palliative operation

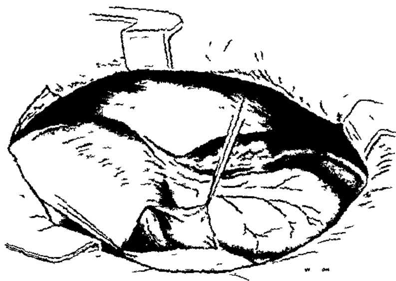


FIG 77 — Block dissection of the stomach for carcinoma of the cardia

of partial gastrectomy in the case of patients who constitute poor risks always provided that it is possible to carry out a reasonable removal and still be left with enough stomach on the proximal side to effect a satisfactory anastomosis without opening the diaphragm

If these criteria cannot be fulfilled recourse must be made to the

Palliative resection of carcinoma involving the cardia. Restoration was effected by oesophago-gastrostomy. Total block dissection of the stomach would now be carried out in a growth of this nature



Exposure of the lower end of the oesophagus through a left trans thoracic incision. The left pulmonary ligament has been divided and the pleura overlying the oesophagus has been incised in a longitu
direction

abdomino-thoracic incision even in the case of the ' bad risk patient When this decision has been made it is a disadvantage to spare any part of the stomach and the block dissection' should be carried out

The Operation

The pre-operative preparation is carried out as described in Chapter XX The patient is arranged and secured firmly in the right lateral position

(i) *The incision* This is made in two stages The abdominal part is made first in order to confirm the diagnosis For this purpose the upper part of the left rectus is divided by an oblique incision placed in such a way that it can afterwards be extended upwards and backwards so as to run along the course of the ninth rib The abdomen is opened and a hand slipped in to feel the region of the cardia If the diagnosis is confirmed the thoracic part of the incision is made

It is to be noted that an accurate estimate as to operability cannot always be made until the thorax is opened and it is often justifiable to proceed even in the presence of metastases in order to carry out a palliative short circuit operation The thoracic part of the skin incision starts at the costal margin at the extremity of the abdominal incision and is carried along the line of the ninth rib to a point beyond the angle It is of the utmost importance to make an adequate incision Skin towels are applied to the edge of the wound

(ii) The incision is deepened down to the ninth rib with the diathermy knife and the rib resected sub-periosteally from the costal cartilage to a point behind the angle The costal cartilage of the ninth rib is excised The intercostal vessels are secured as far back as possible taking care that the intercostal nerve is not included in the ligature A length of the intercostal nerve is removed The pleura is incised

(iii) The diaphragm is held up with a pair of stay sutures and opened as before the only difference being that in this operation the incision is not carried right down to the œsophageal hiatus because it is desirable to remove a fringe of diaphragm together with the stomach and lower œsophagus

(iv) The costal margin is divided

(v) The stomach spleen and great omentum are drawn over to the right so as to put the lieno renal ligament on the stretch The lieno renal ligament is divided cautiously with scissors taking care not to injure the splenic vessels By turning the great omentum upwards and drawing the transverse colon downwards the bloodless posterior

layer of the great omentum can be identified and divided close to the colon until a point close to the pyloric end of the stomach is reached The right gastro epiploic artery is secured and divided close to its origin

(vi) A finger is passed around the back of the pylorus and made to emerge through the lesser omentum By this means the right gastric artery is displayed and is secured and divided

(vii) The duodenum is divided and the stump is closed and invaginated

(viii) The left hand is now placed in the lesser sac and the back of the hand used to lift the stomach upwards and forwards the index finger and thumb being employed meanwhile in drawing the splenic pedicle away from the posterior abdominal wall By this means the tail of the pancreas is drawn well forwards and a series of artery forceps are applied to secure the splenic vessels while the pancreas is divided about 1 in from its extremity

The splenic vessels are tied with silk ligatures and the pancreatic stump oversewn with silk and buried

(ix) The stomach is turned still further upwards and the coeliac axis displayed The lymph nodes along the upper border and anterior surface of the pancreas and those surrounding the coeliac axis are dissected free and the left gastric artery and vein are secured with silk and divided close to the posterior abdominal wall

(x) The freed stomach together with its attachments is folded up into the thorax so that the posterior part of the œsophageal hiatus is brought into view It is now possible to complete the formation of a 'diaphragmatic fringe', under direct vision so that any vessels which are encountered can be secured expeditiously

(xi) When the posterior aspect of the cardia and lower œsophagus have been freed the stomach is returned to the abdomen and the anæsthetist allows the lung to collapse The left pulmonary ligament is divided and an incision made in the parietal pleura over the œsophagus at the proposed line of section Care should be taken not to mobilise the œsophagus for a greater distance than is necessary for the purpose of anastomosis

(xii) It is now ascertained by trial whether a loop of jejunum will reach to the level of the proposed anastomosis without tension If the line of section of the œsophagus is not more than about 2 in above the diaphragm it will usually be found that an undivided loop of small bowel will reach to the required level quite easily and if this is so the

remaining steps of the operation are much simpler than if an anastomosis en Y (Roux's anastomosis) has to be made

(xiii) *Anastomosis with undivided loop* An opening is made in the transverse mesocolon and a loop of small bowel whose apex is about 8 in from the duodeno-jejunal flexure is drawn through An intestinal clamp is applied across the summit of the loop Packs are arranged around the line of the proposed anastomosis and the oesophagus is steadied by means of a stay suture placed accurately at either margin

A clamp is placed across the œsophagus below the line of section but no clamp is applied to the part of the œsophagus which is to be used in the anastomosis

The œsophagus is divided in the manner previously described, that is to say an incision is made right round the œsophagus down to the mucous membrane a band of mucous membrane is thus displayed and the mucous membrane is incised around the lower border of the band This incision is started anteriorly and when a small opening has been made an aspirator is applied to prevent any contamination of the wound An incision is made at the summit of the jejunal loop equal in size to the diameter of the œsophagus The anastomosis is made using interrupted mattress sutures of silk in the posterior layer followed by a continuous layer of fine chromic catgut passing through all layers of both œsophagus and stomach right around the anastomosis The anterior layer is reinforced by a series of interrupted Lembert sutures of silk The stitch at each margin is used to rotate the anastomosis so that the posterior part of the suture line can be reinforced in the same way

A seromuscular stitch is placed in the small bowel ½ in to either side of each extremity of the anastomosis and these stitches are attached to the pleura on either side just above the anastomosis so that when they are drawn tight they prevent any strain from falling on the suture line (Fig 78)

(xiv) *Anastomosis en Y (Roux)* It may be clear early on in the operation that this will be the best method to adopt and in such a case it is an advantage to carry out the mobilisation of the small bowel before dissecting the stomach and its connections free By this means an opportunity is afforded of inspecting the small bowel some time after it has been mobilised and so making sure that the gut used for the anastomosis has an adequate blood supply

The mobilisation of the jejunum must be done with great care A

loop of bowel is held forwards in such a way that its mesentery is stretched out to display its vascular arrangement The summit of this loop is about 8 in from the duodeno jejunal flexure

A point of the bowel is selected which lies between two parallel vessels which are close together Intestinal clamps are applied so that the bowel can be divided between these two vessels without injuring either of them If the mesentery is thin, it is an easy matter to cut towards the base of the mesentery until the vascular arch is reached, when it is secured and divided If the mesentery is fat it may be difficult to display the arch, and the peritoneum on each surface of the mesentery should be divided independently before any attempt is made



FIG 78 —Completion of the anastomosis by bringing up an undivided loop of small bowel

to secure the contained vessels When the arch has been divided the incision is carried distally ligaturing each vessel carefully with silk as soon as it is encountered and taking care not to place the ligature too close to the vascular arch The bowel sometimes assumes a dusky colour after it has been mobilised, and usually shows greatly increased peristalsis After some minutes the colour of the bowel generally returns to normal The proximal segment of bowel is used to effect an end to-side anastomosis into the distal loop the suture line lying just below the opening of the mesocolon (Fig 79)

(xv) *Introduction of a duodenal tube* Whichever method of anastomosis has been used, it is a good plan to pass a narrow duodenal tube before completing the anterior part of the through and through suture

This tube is used in the first instance to prevent distension of the bowel and later on for feeding purposes

(xvi) Penicillin powder is dusted on to the œsophageal bed and the loop or segment of bowel passing up to the anastomosis is sutured to the parietal peritoneum by a series of interrupted silk stitches

(xvii) *Repair of the diaphragm and of the mesocolon* Loops of intestine have a great tendency to herniate through the opening in the

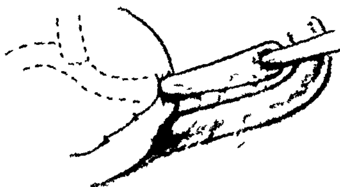


FIG 79—Anastomosis completed by the use of a Roux loop

The proximal segment of bowel is anastomosed to the distal loop of intestine just below the mesocolon and is shown in the drawing in interrupted lines

mesocolon or diaphragm and in each case a very careful repair must be carried out to prevent this

Interrupted silk sutures are used to approximate the margins of the respective openings to the bowel passing through and care must be taken not to interfere with the blood supply In the case of the diaphragm the repair is carried out more easily if the phrenic nerve is crushed

(xviii) *Closure of the wound and water seal drainage of the chest* The same method is used as that described in Chapter XVII

CHAPTER XIX

CERVICAL ŒSOPHAGO-GASTROSTOMY

This operation may be carried out for growths situated at the lower end of the cervical œsophagus or in the upper quarter of the thoracic part of the gullet

The procedure is of such magnitude involving abdomen thorax and the cervical region, that it can be used in only a proportion of the patients suffering from a growth in this part of the gullet For the remainder the surgeon may have to rest content with palliative measures

The patient is prepared for operation in the manner already described (p 163) The operation is carried out in the following stages

(i) With the patient in the right lateral position an abdomino-thoracic incision is made by resecting the eighth rib and extending the incision downwards and inwards to divide the costal margin The details of this part of the exposure follow the descriptions already given

(ii) The diaphragm is divided and the spleen removed The stomach is mobilised with preservation of the vascular arches

(iii) The left pulmonary ligament is divided and the whole of the thoracic œsophagus is mobilised The œsophagus is divided at the lower end and the cut end of œsophagus closed with a suture

The stomach is closed with a double layer of sutures

(iv) The fundus of the stomach is drawn up to the apex of the thorax and held in position by a stay suture the ends of which are carried *through the chest wall just below the inner end of the first rib* The stomach lies in front of the aortic arch and behind the hilum of the *lung*

(v) The diaphragm is stitched around the stomach and the remainder *of the diaphragm repaired*

(vi) An intercostal drain is introduced and connected with a water *seal and the abdominal and thoracic incisions closed* Care is taken to see that the lung is fully expanded before the chest is closed

(vii) The patient is now turned gently into the supine position and

a small sandbag placed under the left shoulder, the head being turned to the right

(viii) An incision is made along the anterior border of the sterno-mastoid and extended downwards over the sterno-clavicular joint to the level of the third costal cartilage

(ix) The lower attachments of the sterno-mastoid are divided and also that part of the pectoralis major which arises from the inner half of the clavicle and first 2 in of the sternum

(x) The inner half of the clavicle and a portion of the first rib with its costal cartilage are resected sub-periosteally

(xi) The cervical œsophagus is exposed by drawing the carotid sheath and its contents outwards (see Cervical Œsophagotomy) and the whole of the thoracic œsophagus drawn out into the neck

(xii) The pleura is opened through the bed of the first rib and the stomach drawn up into the neck in front of the left innominate vein and left common carotid artery

(xiii) The cervical œsophagus is divided above the growth and the cut end is anastomosed to the posterior surface of the fundus of the stomach Before completing the anastomosis a small bore tube is passed into the stomach and the proximal end passed up into the mouth where it is recovered This tube is used subsequently to combat distension and at a later stage for feeding purposes

(xiv) The cervical wound is dusted with penicillin powder and closed in layers

While this is being carried out the lung is kept expanded until the wound is airtight

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CHAPTER XX

CANCER OF THE ŒSOPHAGUS PALLIATIVE PROCEDURES

Inoperability Determined at Operation

The operability of an œsophageal growth can in many cases be determined only by carrying out an extensive exploration which may involve opening both the abdomen and the thorax. If an exploration of this magnitude has been made and resection of the growth is seen to be impracticable every effort should be made to effect some sort of a short circuit operation so that the patient may regain the ability to take food normally.

Inoperable Growths of the Cardia

In this situation common contra-indications to radical excision are the discovery of unsuspected secondary deposits in the liver, wide-spread involvement of lymph nodes, the presence of malignant nodules on the peritoneum or local fixation of the growth.

In these circumstances the œsophagus is divided above the growth and the lower cut end closed with great care and allowed to drop back into the œsophageal bed. Continuity is restored by anastomosing the proximal segment of the œsophagus to the small bowel. The details of this anastomosis vary according to the condition found. If the growth is bulky it will probably prove necessary to carry out a Roux's anastomosis en Y. The mobilised limb of small bowel is brought through a hole in the mesocolon and united by end-to-end anastomosis with the proximal œsophageal segment. The details of this anastomosis are described in Chapter XVIII. When the procedure is palliative only the amount of small bowel mobilisation which is necessary may be greater than when an excision has been carried out. This is because the bulk of the growth may necessitate a detour on the part of the jejunal loop.

If the growth is not bulky and it is possible to bring up an individual

loop of small bowel without tension, this should be done, and the cut end of the œsophagus anastomosed to the summit of the loop

Inoperable Growths of the Thoracic Œsophagus

The common cause of inoperability is local fixation of the growth and it has been stated that unless separation can be effected by means of blunt dissection with the finger excision should not be attempted This statement is not altogether correct but it is true to say that the necessity to use sharp dissection is a bad omen in prognosis

In two situations it is particularly dangerous to try to separate the growth by any means other than blunt dissection these are the hilum of the lung and the arch of the aorta

In the case of a growth lying in close proximity to the arch of the aorta it should not be declared inoperable until the aorta has been mobilised by dividing some of the aortic intercostal arteries When this has been done it is sometimes found that a growth which was thought to be fixed can be separated with comparative ease In any event this mobilisation is nearly always necessary because in carrying out a short circuit of the thoracic œsophagus the anastomosis is best effected above the arch

After mobilisation of the aortic arch the diaphragm and costal margin are divided, the spleen removed and the stomach mobilised with preservation of its vascular arches The pleura overlying the œsophagus below the growth is incised and the œsophagus is freed from its bed by blunt dissection with the finger This mobilisation of the œsophagus is carried up as far as the lower limit of the growth The distal part of the œsophagus and the stomach should now be quite free except at either extremity The upper limit of mobilisation is the growth itself and the lower limit the right gastric and right gastro-epiploic arteries near their origins A finger is now passed around the supra aortic part of the œsophagus This is not difficult provided that the arch has been well mobilised and this in turn depends upon an adequate thoracic incision

The œsophagus is divided above the growth and the lower cut end securely closed and allowed to drop back behind the arch of the aorta The fundus of the stomach is drawn up in front of the arch of the aorta and anastomosed to the upper œsophageal segment The details of the anastomosis and the precautions which are taken to avoid leakage or contamination are the same as in the operation of œsophago-gastrostomy following resection (p 175)

Inoperability Determined before Operation

Evidence of distant dissemination excludes the practicability of excision, but occasionally it may be justifiable to carry out one of the short-circuit operations described above even in the face of such evidence

Alteration in the voice may be found to be due to the paralysis of a vocal cord and if this occurs in a patient whose œsophageal growth is below the level of the aortic arch exploration is usually unjustified

The existence of a fistula between the œsophagus and the air passages precludes excision and makes palliation by any other measures extremely difficult Even if a short circuit can be carried out there is a great risk of fluid regurgitating from the stomach into the air passages by way of the fistula and so drowning the patient Measures to combat this by means of aspiration through a tracheotomy such as might be employed in the management of a non malignant fistula in an adult are scarcely justifiable in the circumstances under consideration Some degree of palliation may be achieved by passing a double tube down the gullet the longer of which passes well into the stomach while the end of the shorter tube lies in the œsophagus Continuous suction is applied to the shorter tube to keep the œsophagus empty and a liquid diet is given through the longer tube This method may be impossible on account of the difficulty in negotiating the lumen of the œsophagus in the region of the growth In such cases a jejunostomy combined with aspiration above the growth may relieve the patient of choking attacks In any event free use should be made of sedatives to help the patient through what is a terminal and fortunately a short phase of the disease

An attempt at excision may be considered to be unwise because of the general condition of the patient even in the absence of any contra indications in so far as the growth itself is concerned Such a decision must not be made lightly and if there is a reasonable chance of surviving the operation the patient should be given the opportunity which surgery alone affords It is particularly important not to be misled by the gross starvation which may be present into thinking that the patient is unfit for any major procedure The improvement which can be effected by attention to the nutritional requirements is sometimes most remarkable and has been discussed in Chapter XI

Sometimes however the age of the patient and perhaps the association of cardiovascular or other disease may make exploration unwise and the fact that the growth is situated at a particular level may be

decisive For example a poor risk patient with a growth at the lower end of the œsophagus might be subjected to an operation with a reasonable chance of recovering from the resection whereas if the same patient suffered from a growth at the level of the arch of the aorta or in the upper quarter of the thoracic œsophagus or at the extreme lower end of the cervical œsophagus the increased operative risk entailed would make any attempt unjustifiable

It is in these circumstances that Souttar s tube proves such a useful palliative measure

Intubation with Souttar s Tube

The credit of intubating the œsophagus should be accorded to Charters Symonds who used a gum-elastic tube with a funnel shaped extremity Souttar introduced an improved tube which consists of a close spiral of German silver wire the upper end of the tube being enlarged to form a collar The flexibility of the tube enables it to conform to the lumen of the œsophagus even when this is distorted by the growth

The growth is inspected with a wide bore œsophagoscope The lumen may be difficult to find and it is usually necessary to use graduated bougies to dilate the lumen cautiously when it has been found

The tube is led down the œsophagus on a guide which passes down the lumen beyond the growth and is pushed into its final position by means of a special introducer The introducer which terminates in a collar that presses against the upper end of the Souttar s tube serves to retain the tube in position while the guide is being withdrawn

Intubation is not without danger hæmorrhage and perforation being accidents which can easily occur Other disadvantages are that the tube may become dislodged and pass beyond the stricture or the lumen of the tube may become blocked by extension of the growth In spite of these drawbacks however the use of Souttar s tube sometimes provides a valuable palliative measure which may enable the patient to resume a more or less normal life until death occurs from dissemination (Fig 80)

Careful instructions must be given to avoid hard lumps of food which may block up the tube Each meal should be followed by a drink and several times during the day the patient should sip a dilute solution of hydrogen peroxide



FIG 80.—Souttar's tube in position

The patient was a man of [illegible]enty three wh[illegible] condition was [illegible] ength [illegible] intro-
duction of the tube he was able to swallow [illegible] and became strong enough to take long
walks. He continued in comfort for some months and then died [illegible] from pulmonary com-
plications

Irradiation

Radium and X rays have both been employed in the treatment of cancer of the gullet X ray treatment of post cricoid growths has been followed by some encouraging results and should be used if excision is not practicable

The depth of the thoracic œsophagus makes X ray treatment of this part of the gullet an unsatisfactory procedure and from the point of view of palliation it is inferior to the methods which have been discussed

Intra-œsophageal radon implantation on the other hand is an excellent palliative procedure and if excision is impossible it proves the best means of relieving the patient

The drawback to the method is the practical difficulty of placing the radon seeds with accuracy Negus has devised and practised a method whereby he implants linked radon seeds Negus inspects the growth with a wide bore œsophagoscope and having found the lumen dilates the stricture sufficiently to allow the passage of a large Chevalier Jackson s bougie The bougie is withdrawn until the shoulder of the instrument is felt to rest on the lower end of the growth The part of the stem of the bougie which projects beyond the mouth of the œsophagoscope is measured The bougie is withdrawn until the shoulder is level with the upper end of the growth and the stem measured again The length of the stricture is found by subtraction and an allowance is made for the extension of the growth at either end of the stricture

Chains of gold screened radon seeds are prepared either by linking the seeds together with catgut or by placing them into silk or rubber tubes with a bead between each radon seed Whichever method is used the centre of each seed is 1 cm from its neighbour

A special introducer is used and loaded with a column of seeds about 1 cm longer than the stricture Care is taken that the œsophagoscope lies in the axis of the gullet The introducer is pushed into the growth to the estimated depth and the column of seeds left in position Three or four columns are used so as to irradiate the whole growth If silk or rubber tubes have been used the columns are removed at the end of ten days This method of implantation demands not only very specialised instruments but a degree of technical skill of the highest order

Dilatation

In exceptional circumstances it may be possible and justifiable to dilate the œsophagus cautiously. There is a risk of perforating the œsophagus or of precipitating hæmorrhage if the procedure is carried out roughly.

Gastrostomy

As a method of palliation this is inferior to those which have been discussed and in general it should be reserved for those patients who are threatened with death from thirst and starvation and who cannot be alleviated in any other way. In these circumstances it is a great advantage to the patient if even a small lumen can be maintained by dilatation so that the saliva can be swallowed.

In exceptional cases a combination of factors such as the age and general condition of the patient, coupled with the situation of the growth, may make an exploration inadvisable and some local condition such as a deformity of the spine may preclude any endo-œsophageal palliative procedure. In the presence of such an unfortunate combination of circumstances an early gastrostomy is often desirable. If an adequate gastrostomy diet is given and no solids are allowed by mouth it is often possible to maintain the patient's strength and postpone the time when the lumen of the œsophagus becomes completely occluded. In the meantime the occurrence and growth of metastases may supervene and enable the patient to die with less distress. If a gastrostomy is decided upon it should be of the Kader Senn type and the catheter used should be of sufficiently large bore to lessen the risk of it becoming blocked.

Miscellaneous Details

If it has not been possible to short circuit the growth, the patient should be instructed to take frequent sips of water or other liquids. Soda water and dilute hydrogen peroxide solution both help to keep the lumen clear of mucus and debris, and in the case of the peroxide solution a mild antiseptic action is added which diminishes the infection which is very likely to be present.

Symptomatic treatment should be given as the need arises, and attention to details such as the presence of impacted fæces may relieve the patient of much unnecessary discomfort and, what is perhaps more important, may prevent that feeling of hopeless despair which might otherwise overwhelm him.

If pain supervenes or distress becomes acute sedatives must be given and it has been found useful to administer morphia gr ¼ (gram 0 016) and aspirin gr 10 (gram 0 65) in the form of a powder given by mouth As the necessity arises the proportion of morphia in the powder can be gradually increased

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CHAPTER XXI

ŒSOPHAGEAL OPERATIONS POST OPERATIVE MANAGEMENT

Strict attention to the post operative management must start as soon as the patient leaves the operating theatre, and it must be maintained with unremitting care for perhaps as long as three weeks Lack of vigilance for a brief period immediately after the operation may easily result in the patient s death *Unless adequate informed and conscientious nursing facilities are available, the operations which have been described should on no account be attempted*

Transferring the patient from the operating table to the bed With the use of light anæsthesia combined with relaxant drugs the patient *is often nearly conscious within a few minutes of the conclusion of the operation* The anæsthetist aspirates any mucus which may be present in the trachea or main bronchi and if the patient has started to move administers an injection of morphia gr $\frac{1}{6}$ (gram 0 01) The patient is lifted on to the bed with the utmost gentleness care being taken to see *that the intercostal drainage tube does not become kinked in the process*

As soon as the patient reaches the ward an oxygen tent is placed in position and the patient is watched carefully so that steps can be taken to combat any surgical shock which may develop

Care of the Lungs *The most serious complications to guard against during the first few days are the accumulation of secretions in the bronchi and the collection of air or fluid in the pleural cavity*

Bronchial secretions *It should be the aim to restore normal breathing as soon as possible and to this end the oxygen tent should be discarded when it is no longer absolutely necessary* Deep breathing is inevitably painful unless relieved by morphia and this should be given frequently for the first forty eight hours *but in small doses* (gr $\frac{1}{8}$ to gr $\frac{1}{6}$ (gram 0 008 to gram 0·01) so that the cough reflex is not abolished

The best way of clearing the bronchi of secretions depends upon the

circumstances but often it is most safely accomplished by encouraging the patient to cough and expectorate at regular intervals suitable times being soon after an injection of morphia has been given The patient must be helped and reassured and holding the chest firmly to prevent the pain of extreme movements will prove of great assistance

It may be found that help is obtained by raising the foot of the bed and turning the patient first on one side and then on the other The breathing of carbon dioxide and oxygen at intervals will stimulate coughing

The method of passing a catheter blindly through the nose into the trachea for the purposes of aspiration may be helpful partly because of the coughing which is provoked Aspiration through the broncho scope is a sure way of removing the secretions but the disturbance to the patient which sometimes accompanies this procedure makes it undesirable except under exceptional circumstances

It is very important that this attention to the patient s lungs should be carried out on the same occasions as other nursing details such as massaging the legs taking the pulse temperature or blood pressure Failure to concentrate the nursing details in this manner will result in the constant disturbance of the patient who will be deprived of the periods of sleep which are essential for a successful outcome of the operation

Collections of air and fluid in the pleural cavity Post operative troubles resulting from pleural collections are best prevented by making sure that the lung is fully expanded at the end of the operation that the chest is firmly closed and that there is minimal bleeding from the œsophageal bed It must not be forgotten that the opposite pleura may have been inevitably accidentally or unwittingly opened during the course of the operation and if there is the slightest possibility that this has happened aspiration of this pleural cavity should be carried out at the end of the operation

Care is taken to see that the intercostal drain is not kinked or blocked, and the water seal drainage bottle is inspected frequently to make sure that the column of fluid is moving with respiration and that a satis factory negative pressure (3–5 in of water) is maintained

The state of the lungs and pleural cavities is checked by X ray examination carried out daily for three or four days but the X ray findings must always be interpreted in conjunction with the patient s clinical condition and any sudden dyspnœa or unexplained deteriora tion should lead to exploration of the chest with the aspirating needle

The intercostal drainage tube is removed as soon as it becomes plain that hæmorrhage has ceased which is usually on about the third day Care is taken in withdrawing the tube to see that air does not enter the chest and an effective way of ensuring this is to wrap a piece of lint spread thickly with zinc and castor oil ointment around the tube and to hold it firmly against the chest wall during the withdrawal The lint is then strapped to the skin

Pleural collections may occur after the drainage tube has been removed and should be suspected if dyspnœa develops

If the post-operative course has been favourable the patient may be lifted into a chair two or three days after the operation

The breathing exercises are increased as the patient gets stronger but in the effort to prevent the onset of chest complications, care should be taken not to overtax the patient s strength

Maintenance of fluid balance A large fluid intake by mouth is undesirable in the early stages because of the risk of a leak occurring and also because it would favour the development of paralytic ileus In the case of an operation on the cervical œsophagus or pharynx the risk of a leak is considerable should the patient be allowed or encouraged to drink large draughts of fluid This is because the violent movements of the pharyngeal muscles which may occur in these circumstances may throw considerable strain on the nearby suture line

This consideration does not apply when the suture line is in the thoracic œsophagus, but on the other hand when the stomach or small bowel has been used to complete the anastomosis there is a risk of distension occurring and this in turn may be followed by leakage or the development of paralytic ileus

After either type of operation it is wise to have a Ryle s tube passing through the patient s nose and reaching to a point beyond the anastomosis

This should be aspirated at frequent intervals for the first thirty six hours and if there is then no evidence of the onset of ileus it may be removed unless required for feeding purposes

Although it is desirable to limit the fluid intake by mouth it is not wise to deprive the patient completely Saliva will be swallowed in any event and no harm can result in washing this down with small repeated sips of boiled water followed by penicillin solution This should be allowed twelve hours after operation and apart from diminishing the risk of parotitis it has a good psychological effect on the patient particularly if he was previously unable to swallow

For the first forty eight hours reliance must be placed on intra venous fluids to maintain the proper fluid balance

Small bowel strangulation Herniation may occur through the dia phragmatic incision or through the opening in the transverse meso colon when this route has been employed

The diagnosis of strangulation may be difficult and an operation undertaken for its relief is bound to be extremely hazardous under the circumstances

For these reasons every possible care should be taken to guard against the complication The best way to achieve this is by a meticulous attention to detail at the original operation making sure that the dia phragm and mesocolon are carefully sutured to the portion of stomach or bowel which passes through

Reflux œsophagitis When the stomach has been brought above the diaphragm to restore the continuity of the gullet there is always the risk of œsophagitis developing owing to the destruction of the cardiac sphincter This risk is minimised by putting the patient on to the same sort of regime as has been advised for the medical management of reflux œsophagitis (Chapter IX)

Stricture formation As soon as it is safe to do so the patient should be encouraged to take solid food Each bolus of food acts as a dilator and tends to prevent the formation of a stricture but if one should develop it may be treated by auto dilatation with gum elastic bougies (Chapter VIII)

CHAPTER XXII

RARE AND UNUSUAL CONDITIONS OF THE ŒSOPHAGUS

Sarcoma

Primary sarcoma of the œsophagus is a condition of the greatest rarity and Dvorak in 1931 was able to find less than fifty reported cases. Most of the cases have been examples of leiomyosarcoma or fibrosarcoma. Clark recorded a successful resection which was carried out in 1947. The growth which proved to be a fibrosarcoma was situated in the upper part of the œsophagus and extended from the level of the clavicles to a point below the arch of the aorta. The patient was a man of forty three and eight months before admission to hospital he had difficulty in swallowing solids. The dysphagia disappeared after one month and he was free from symptoms for six months. At the end of this time he developed dysphagia again and on this occasion the symptom became progressively more severe until he had difficulty with fluids.

A left sided thoracotomy was carried out and the whole of the thoracic œsophagus resected, the continuity of the gullet being restored by bringing up the stomach and making a high intra thoracic anastomosis.

The immediate convalescence appears to have been uninterrupted.

The fact that the patient experienced a remission of his symptoms for six months following the onset of his dysphagia, is of interest. The explanation of the remission is presumably due to the fact that the growth was pedunculated and became detached.

The diagnosis of this rare condition rests on histological examination and as a general rule the clinical history is identical with that of carcinoma of the œsophagus. Radiological examination may show that the obstruction is due to a polypoid mass, the nature of which must be determined by obtaining an adequate portion of the tumour for biopsy.

Bayer has reported a patient with sarcoma of the œsophagus who was treated by irradiation and who was free from symptoms fifteen months later.

Melanotic Sarcoma

Jaleski and Waldo described an example of this condition found at post mortem examination The primary lesion was a polypoid mass in the œsophagus and there were extensive metastases in the surrounding lymph nodes and in the lungs liver pancreas and spine

Simple Tumours

Simple growths of the œsophagus are extremely rare and of little importance when compared with their malignant counterpart Their rarity has however always made them objects of interest and this interest is increased by the bizarre symptoms which they tend to produce

Simple growths may arise from any of the coats composing the œsophagus and may be single or multiple The first published report is that of Schmieder in 1717

In 1932 Patterson was able to find only sixty one reported cases most of which were described as papillomata or adenomata or merely as polyps of unspecified nature In addition there were examples of myoma leiomyoma lipoma fibroma and hæmangioma as well as aberrant thyroid and epithelial and dermoid cysts

Symptoms In some instances the tumour has given rise to no symptoms during life and the condition has been disclosed as an incidental finding at autopsy In other cases progressive dysphagia has led to the erroneous diagnosis of malignant disease Œsophageal cysts may attain a considerable size and as the enlargement is outwards towards the pleural cavities the symptoms and signs produced are those of an empyema

A polypoid type of growth tends to grow a long stalk in this position and this fact may result in the production of the most remarkable symptoms

Patterson s patient was a man of fifty four in whom a mass repeatedly came up into the back of his throat and then disappeared The tumour which proved to be a myxofibroma was found to be attached to the left wall of the œsophagus 2 cm below the pharynx The narrow pedicle was severed with some difficulty

Dallas reported a similar case in 1763 but in his patient the stalk of the polypus was so long that when the patient was made to retch the polypus projected as far as the front teeth Contemporary records have outdistanced this and Chitty published a case of a male Chinese of twenty six who during a fit of coughing expelled a long fleshy polyp for a distance of 7 in beyond his teeth The pedicle was attached

posteriorly to the junction of the pharynx and œsophagus. It was severed after opening the œsophagus by a cervical incision. Healing was delayed by suppuration but no stricture occurred.

Weyrich has recorded the case of a man who died suddenly at the age of fifty eight, and at autopsy was found to have a lipoma attached by a long pedicle to the œsophagus at the level of the first thoracic vertebra. From its attachment the lipoma extended upwards for a distance of 9.5 cm. to the entrance of the larynx, where the swollen œdematous end of the tumour had blocked the airway.

Dubois described a similar case in 1818, but in his patient the stalk of the polyp was ligatured, the tumour came away during sleep, found its way into the air passage and killed the patient by suffocation.

In the case recorded by Brock, indigestion, loss of energy and weight and the presence of a secondary anæmia, together with the radiographic findings led to the diagnosis of carcinoma of the cardia. Cardio-œsophageal resection and anastomosis were carried out successfully. This was the first successful operation of this kind recorded in Europe. Subsequent examination of the specimen showed that the tumour was a pure myoma measuring 10×7 cm. and having on its surface two large chronic simple ulcers.

Morell Mackenzie writes that in two of his three cases the patients were convinced that they had a foreign body lodged in the throat. On the assumption that their diagnosis was correct, he proceeded to treat them by the best means at his disposal. This consisted in the passage of a parasol probang. On withdrawing the instrument, in each case with some difficulty, he produced a fibrous polyp. Both patients recovered after a somewhat stormy convalescence.

Diagnosis. X-ray examination with a barium swallow will show a filling defect and the smoothness of the outline may suggest the simple nature of the tumour. Bearing in mind the great rarity of simple tumours in this situation the diagnosis must be confirmed by œsophagoscopy.

Treatment. Pedunculated tumours should be removed through the œsophagoscope. The removal must be complete.

Myomata have been removed by thoracotomy without opening the lumen of the œsophagus.

Syphilis of the œsophagus

The frequency with which syphilis affects the œsophagus is extremely difficult to determine. The older writers described many examples of

the condition but it seems probable that the diagnosis was often at fault because the cause of many of the non malignant diseases of the œsophagus is obscure and there was a great tendency in an age when untreated syphilis was a commonplace to regard all unexplained diseases of the gullet as syphilitic in origin Hudson and Head who read a paper on the subject in 1919 were able to find a total of seventy five cases in the literature

It is possible that the œsophagus may become ulcerated during the secondary stage of the disease but all the proved cases which have been recorded have been examples of tertiary syphilis

The lesion which is produced is either a submucous gumma or a diffuse inflammatory reaction The lower quarter of the œsophagus appears to be less often affected than the rest of the gullet Ulceration is liable to occur and this may lead to the formation of a fistula into the trachea or bronchus Healing of the ulceration is often followed by scarring and stenosis

Symptoms Progressive dysphagia sometimes extending over a long period is the characteristic symptom Pain is not usually a feature If a tracheo œsophageal fistula is present violent coughing may follow the taking of fluids The clinical history is in fact identical with that of carcinoma of the œsophagus and the fact that the history may have extended over a long period does not exclude the diagnosis of cancer because malignant disease not infrequently intervenes upon a simple and long standing obstruction

Radiological appearances The X ray findings are characteristic the walls of the gullet are rigid and there is very little change in the contour or size of the bolus as it passes through the stricture The outline of the barium shows a fine irregularity which contrasts with the more gross irregularity produced by cancer

Œsophagoscopy There may be an appearance of generalised œso phagitis the upper and middle parts of the gullet being most affected The epithelium may be sodden and macerated and actual ulcers may be visible These ulcers resemble gummatous ulcers elsewhere having clear cut edges and a dirty looking slough in the floor Patches of leukoplakia occur

Treatment Anti specific treatment should be given and if there has been ulceration with subsequent scarring and stenosis dilatation may be required If a tracheo œsophageal fistula is present it may be necessary to feed the patient by means of an indwelling gastric tube while the medical treatment is being carried out Sometimes it may

be preferable to make a gastrostomy and if the bronchial secretions are very copious a temporary tracheotomy may be called for.

Simple Œsophageal Cast

This is an exceedingly rare condition and Patterson in reporting a case in 1935 found records of seventeen other patients. Following Patterson's case the next recorded example of this condition was that of Willcox in 1919. Willcox's patient was a woman of forty who brought up an œsophageal cast in 1933. During the next five years she produced two more casts and in 1918 yet another. Several times during this period she complained of salivation and thought that she was going to expel a cast but this did not in fact occur. On each occasion when she shed a cast she noticed a burning sensation behind her sternum after tea. Excessive salivation occurred and swallowing became painful and the saliva seemed to stick half way down the œsophagus. After about half an hour of this feeling she was able to swallow her saliva and vomited up a tube which hung from her mouth and remained attached to the back of her throat. On one occasion she bit the tube through and on the second and third occasions cut it away with scissors. The last time a cast was produced she pulled the whole tube away. On each occasion she has brought up a little blood with the tube and later regurgitated about half a pint of blood stained fluid. On the last occasion she continued to vomit for a fortnight but there was no further blood staining. Following the shedding of the cast the swallowing of saliva caused pain and this pain continued for about a fortnight. After about six weeks she felt normal. There was nothing in the previous history which appeared to have any bearing on her condition and investigation of the œsophagus and stomach showed no obvious abnormality. There was no regurgitation from the stomach into the œsophagus and the serological reactions of the blood were negative.

Patterson considered that the condition starts with a low grade œsophagitis followed by excessive epithelial growth with a separation of the mucosa probably beginning at the cardiac end. In most of the recorded cases there has been no adequate explanation of the occurrence although casts have occurred following diphtheritic œsophagitis.

Non-specific Granulomatous (Regional) Œsophagitis

This is an extremely rare condition the histological picture of which appears to resemble regional ileitis. The author in collaboration with

Selwyn Taylor published an account of three patients in whom the condition appeared to be that of regional œsophagitis

Careful investigation of these patients failed to show any association with tuberculosis or syphilis nor did the condition appear to be that of reflux œsophagitis

In one of the patients the clinical radiological and œsophagoscopic appearances all suggested a carcinoma of the œsophagus If biopsy had been omitted and radiotherapy given a cure by this treatment might well have been claimed

The biopsy material in two of the patients showed granulation tissue heavily infiltrated with polymorphonuclear leucocytes In all three cases the lower third of the gullet appeared to be normal One patient was successfully treated by dilatation and in the other two resection was carried out with a satisfactory result

Œsophageal Symptoms in Association with Scleroderma

Scleroderma is a progressive disease which often starts with a feeling of stiffness in the joints and Raynaud like phenomena in the extremities In the generalised form of the disease the skin becomes dry and scaly and over the face where the changes may be particularly obvious the skin becomes tightly drawn over the bones The forehead may show pitting on pressure The tips of the fingers are often particularly affected and destruction of the terminal phalanges occurs

A form of the disease which is more or less symmetrical and confined to the extremities is referred to as sclerodactylia

Whichever form the disease takes it may be associated with visceral changes

The underlying cause is not clearly understood but it seems probable that in many cases the condition is associated with a lesion of the sympathetic system On this basis some of the œsophageal symptoms which occur may be due to sympathetic irritation in the early stages leading to œsophageal dilatation As the disease progresses sympathetic paralysis occurs and this is accompanied by an improvement in the œsophageal symptoms

The thickening of the epithelium of the œsophagus also plays a part in the production of dysphagia both by its mechanical effect and because it interferes with the propagation of the contracting waves Recognition of the condition is occasionally of importance in making a differential diagnosis of dysphagia

Congenital Strictures Persisting into Adult Life

Many such cases have been described but it seems probable that most of them have been examples of stricture formation resulting from reflux œsophagitis However there are undoubtedly some examples of congenital stricture the effects of which the patient has minimised by the expediency of taking a very careful diet, and it is certain that some of these strictures persist into adult life The following two patients are probably examples of this

A woman of twenty four years complained of slight dysphagia dating from early childhood The dysphagia had gradually increased and this together with the fact that she was shortly to become married led her to seek advice On taking her history it was found that she had periods of partial remission but was never completely free from symptoms She had no pain or heartburn suggestive of œsophagitis and a barium swallow (Fig 81) showed what appeared to be normal œsophagus below the stricture Œsophagoscopy did not disclose any evidence of œsophagitis The patient was taught to pass œsophageal bougies every day and within a few weeks was symptom free She has been able to decrease the frequency of the bouginage subsequently and should shortly be able to discontinue treatment altogether

Another young woman twenty three years of age presented with a rather similar history She differed however in that she suffered from severe heartburn from time to time especially on lying down This history together with the fact that intermittent dilatation had already been tried and failed led to a revision of the diagnosis and she was thought to be suffering from reflux œsophagitis The radiological appearance (Fig 82) was consistent with this Medical treatment for reflux œsophagitis was instituted but without any spectacular result Partial gastrectomy by the Billroth I method was carried out by the abdominal route

The symptoms of heartburn disappeared and it was thought that the dysphagia might also disappear as has occurred in other apparently similar cases This happy result has not followed however and although the patient no longer has pain or heartburn she still suffers from attacks of dysphagia which have necessitated bouginage The passage of a small bougie relieves her temporarily, but any attempt to increase the size is followed by painful spasm

Unusual Disorders of Œsophageal Peristalsis

A woman of seventy five presented with almost complete dysphagia of several months duration When she was seen in the Out patient Department she had considerable difficulty in swallowing even liquids A barium swallow (Fig 83) showed a severe degree of œsophageal obstruction



FIG 81 —Congenital stricture persisting into adult life

Her general condition was extremely poor quite apart from her emaciation which was extreme and she was admitted to hospital It was not

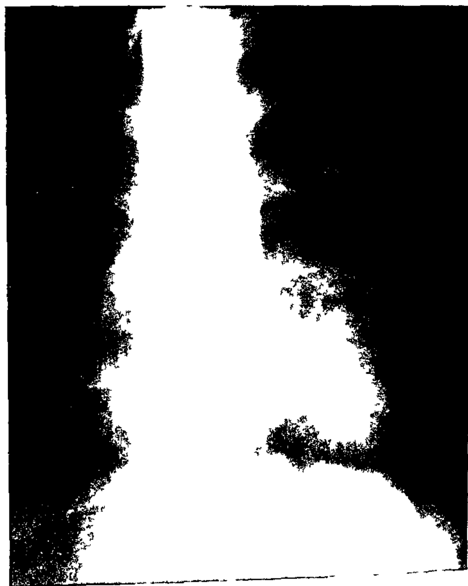


Fig 82—Stricture in a woman of twenty three

The nature of this is still in doubt

considered that she would ever improve sufficiently for any operative procedure to be undertaken Within a few days of her admission swallow

ing started to improve and gradually became quite normal The progress was maintained and she was discharged X ray examination four months later did not show any abnormality in the œsophagus (Fig 84)

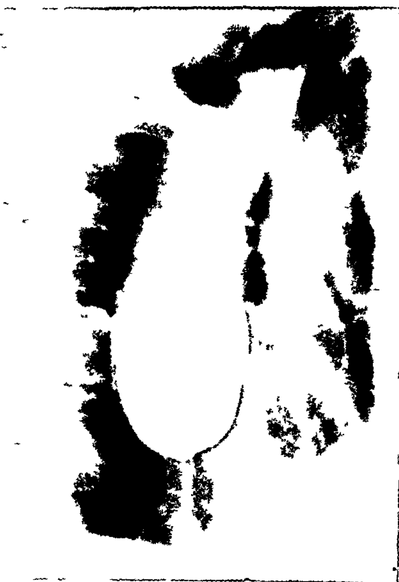


Fig 83 —Barium swallow examination on July 29, 1947 showing an almost complete œsophageal obstruction

Obstruction due to Extrinsic Pressure

Dysphagia from extrinsic causes is usually slight, but occasionally a serious degree of obstruction is produced

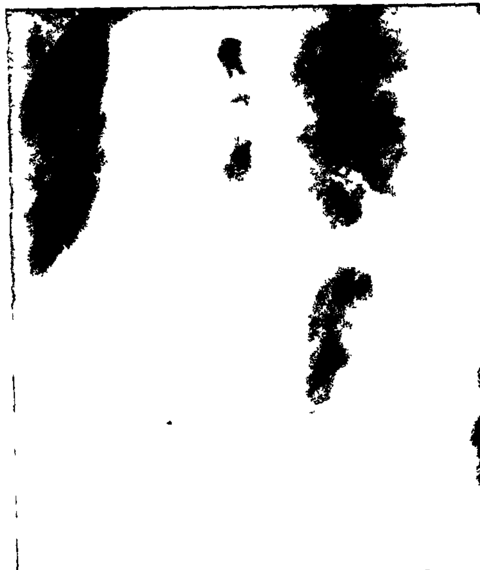


FIG 84 —Barium swallow examination on December 3 194‾
No spec al treatment has been given and th rad logi l appearance is now n rm l

One such case was that of a woman whose history of gradually increasin dysphagia left little doubt that she was suffering from cancer of the gull t Careful clinical examination di clo ed a small carcinoma of the brea t and

raised the possibility of malignant lymph nodes in the mediastinum being the cause of the dysphagia This possibility was supported by the failure to find any intrinsic obstruction at œsophagoscopic examination



FIG 85 —Radiological appearance of a patient suffering from œsophageal obstruction due to tuberculous lymph nodes

Another case presenting difficulty in diagnosis was that of a woman who had a long history of dysphagia Her barium swallow was remarkable

(Fig 85) and in view of the smoothness of the outline of the œsophagus it was thought at first that the patient might prove to be suffering from a



Fig 86 —Barium swallow showing a diaphragmatic hernia with a long stricture of the œsophagus

benign intrinsic obstruction Œsophagoscopy was unsatisfactory and exploration was carried out A large mass was found in the mediastinum and in order to examine it properly the arch of the aorta had to be

mobilised When this had been done it was clear that the mass consisted of a collection of grossly enlarged lymph nodes which appeared to be tuberculous The chest was closed and the fortunate and unexpected sequel was that the patient was completely relieved of her symptoms Her improvement was presumably due to the mobilisation of the aorta allowing more room for the œsophagus

Unusually Extensive Stricture due to Reflux Œsophagitis

A woman of sixty presented with a history of retrosternal pain and dysphagia associated with occasional regurgitation of blood X ray examination (Fig 86) showed a diaphragmatic hernia with a long stricture above it

Œsophagoscopy showed an area which was suspicious of carcinoma and although this suspicion was not confirmed histologically it was felt that exploration should be carried out At exploration the stricture was found to extend almost to the arch of the aorta The condition appeared to be simple It was felt that the ideal treatment would be total gastrectomy and excision of the stricture but this would have entailed bringing a Roux loop above the aortic arch and it was not considered a justifiable risk in view of the patient s age and the non malignant nature of the disease

Accordingly the excision was modified and the lower half of the œsophagus and the proximal half of the stomach were removed Continuity was re established by a supra aortic œsophago gastrostomy The patient made a good recovery and is completely free from symptoms but in view of the possible persistence of reflux œsophagitis she has been put on a careful medical regime

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